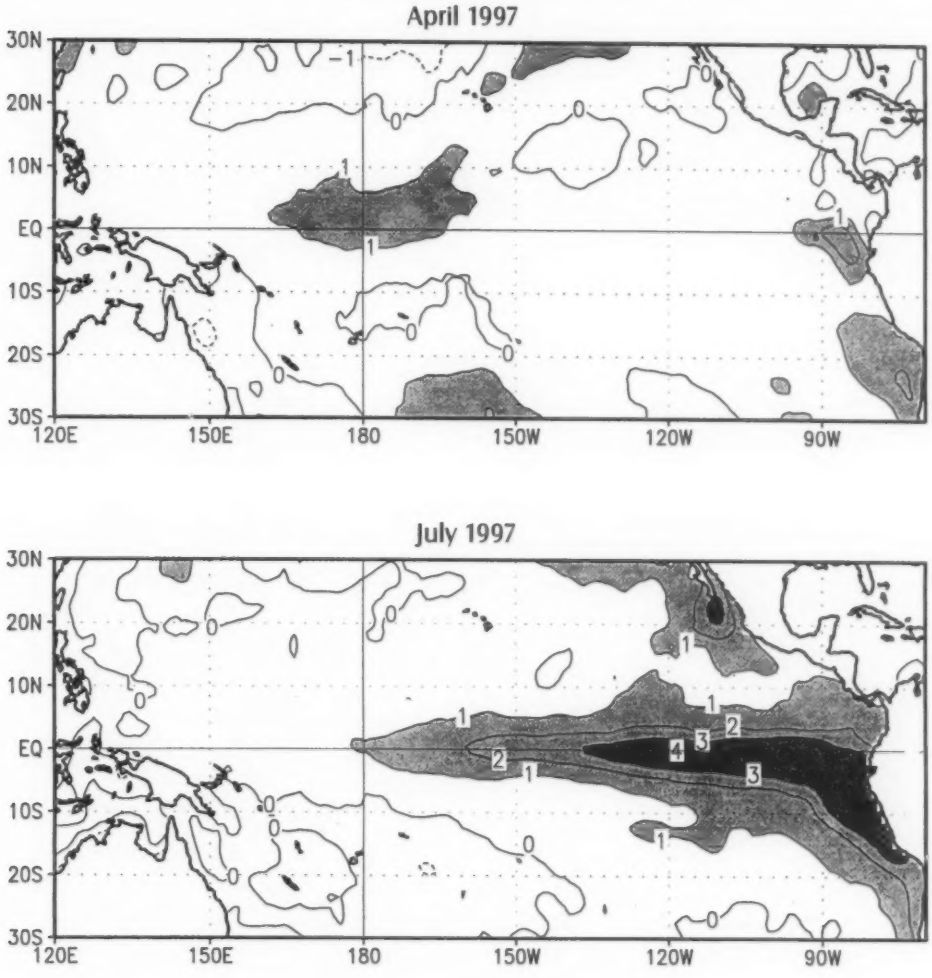
Mariners Weather Log

Vol. 41, No. 1 Spring 1997

SST Anomalies (deg C)



The Mighty El Niño

Strong positive sea surface temperature anomalies have developed rapidly since April 1997 in the equatorial Pacific Ocean east of the dateline. The July 1997 anomalies are comparable to the strongest warm episodes of this century. See page 4.

Mariners Weather Log

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From the Managing Editor

Three major events of international importance to the oceans will occur during the next year. First, to recognize the influence of the oceans, the United Nations has designated 1998 as the International Year of the Ocean (YOTO). This will focus much attention on the ocean and its role in the economic health and quality of life on the planet. YOTO's varied themes will include ocean policies and programs, maritime transportation, ocean resources, marine environmental quality, recreation and tourism, weather, climate, and natural hazards. YOTO activities will be centered in Lisbon, along with those of the second major marine event of the year—Expo Oceans 1998, a worlds fair of the oceans.

Third, mother nature has decided to put on a grand display of its own—an exceptionally strong El Niño which is likely to last until at least spring 1998. The El Niño begins with a collapse of the prevailing low-level easterly trade winds in the eastern pacific ocean. Sea surface temperatures in this area then rise as the upwelling of cold water in the area ceases. What makes this El Niño stand out so much is not only the SST anomalies of 5° C in places, but also the two occasions since April 1997 when the winds at low levels in this area have become westerly—a 180° reversal from normal! This is very unusual (previous strong El Niños have experienced this once at most; it doesn't happen during weaker El Niños). The westerlies act to amplify the warming at the sea surface.

Since the 1960s, several El Niño cycles have been closely studied, and the linkage between the equatorial east pacific sea surface temperature anomalies and weather events worldwide is now known, although much remains to be learned. There are also important connections between El Niño and marine biological phenomena, world agriculture, and other events.

Weather events are interconnected. What happens in one area effects neighboring areas, and in some cases (as with El Niño), a chain reaction of weather phenomena appears globally. Large scale atmospheric circulation patterns have been likened to giant conveyer belts, carrying weather systems with them.

Please see the article by Dr. Kousky, NOAA's leading El Niño authority. We will run more El Niño articles as the event unfolds. We'll also keep an eye on proceedings in Lisbon. If you are operating a vessel in the equatorial Pacific, your cooperation as weather observers will be especially appreciated for the duration of this El Niño event.

Martin S. Baron⚓

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Warm (El Niño) Episode Conditions Return to the Tropical Pacific

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Introduction

Interannual variations of ocean surface temperatures in the equatorial central and eastern Pacific have been linked to persistent regional and global atmospheric circulation anomalies. A large scale abnormal warming in the equatorial Pacific is called El Niño, a term which also commonly refers to the large scale atmospheric effects related to the warming. This phenomenon is closely related to a global atmospheric oscillation known to scientists as the Southern Oscillation (SO). During El Niño episodes lower than normal pressure is observed over the eastern tropical Pacific and higher than normal pressure is found over Indonesia and northern Australia. These conditions characterize the warm phase of the SO, which is often referred to as an El Niño/Southern Oscillation (ENSO) episode. During periods when ocean surface temperatures are colder than normal (the cold phase of the SO), lower than normal pressure is found over Indonesia and higher than normal pressure is observed over the eastern tropical Pacific. These anomalous pressure patterns are associated with corresponding changes in the strength of the low-level equatorial easterlies (winds that blow from east to west), that generally prevail over the central and eastern Pacific. During warm episodes the easterlies are weaker than normal, and in some cases reverse to westerly (west to east) winds over sections of the central equatorial Pacific. This results in weaker than normal equatorial upwelling and is consistent with warmer than normal sea surface temperatures. During cold episodes, the anomalous pressure pattern results in stronger than normal easterlies and enhanced equatorial upwelling. During warm (ENSO) and cold episodes the normal pattern of tropical precipitation becomes disrupted. This affects tropical atmospheric circulation features, such as the jet streams in the subtropics and in the temperate latitudes of the winter hemisphere. The jet streams over the Pacific Ocean are stronger than normal during a warm episode and weaker than normal during a cold episode. Also, during warm and cold episodes extratropical storms and frontal systems follow paths that are significantly different from normal, resulting in persistent temperature and precipitation anomalies in many regions.

Recent Developments in the Tropical Pacific

Weak to moderate cold episode conditions prevailed during most of 1995 and all of 1996. During this period, enhanced easterlies contributed to a build-up of upper ocean heat content in the western Pacific warm pool region (area

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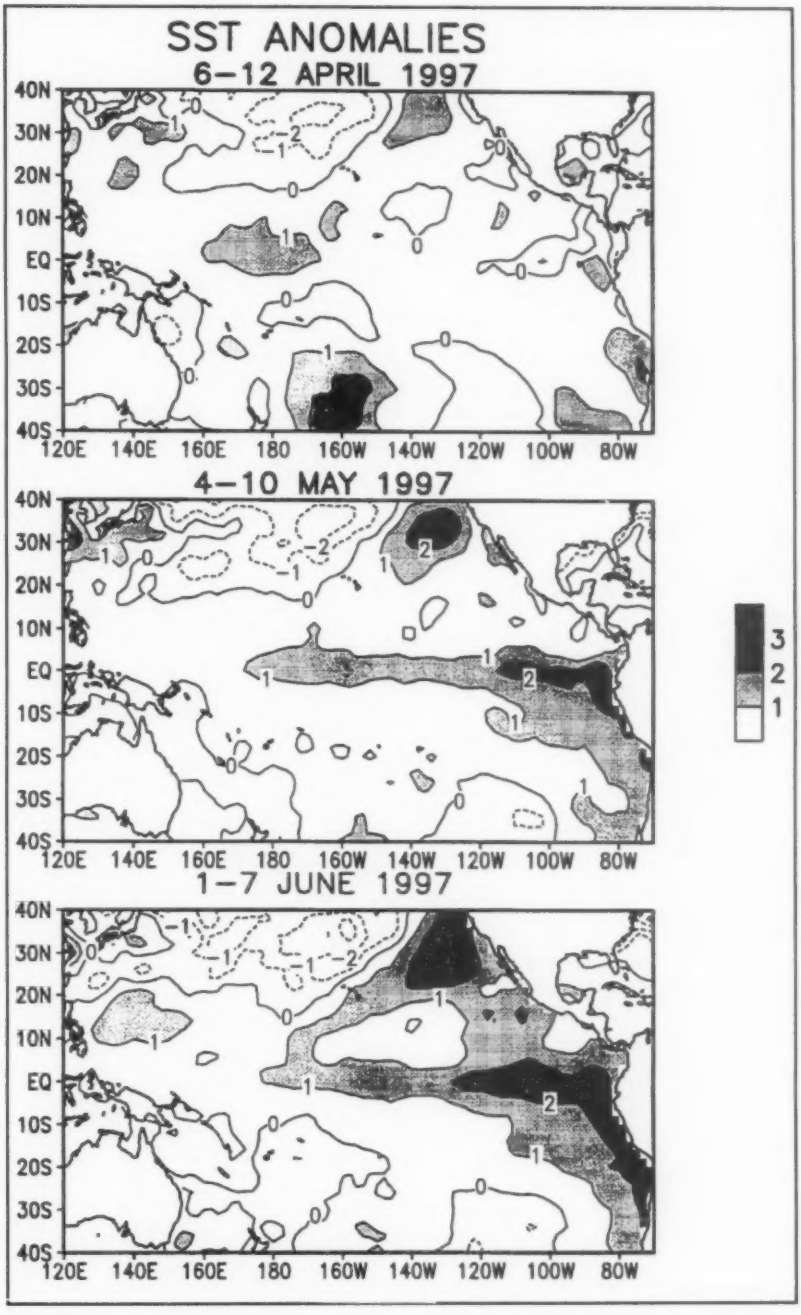

Figure 1. Sea surface temperature anomalies (C) for 6-12 April 1997, 4-10 May 1997 and 1-7 June 1997. Contour interval is 1C. Shading denotes positive anomalies. Anomalies are departures from the 1950-1979 adjusted OI climatology.

El Niño

Continued from Page 4

just east of the Philippine Islands). This is generally viewed as a precursor to El Niño. Cold episode conditions faded rapidly during January-March 1997 as the sign of sea surface temperature (SST) anomalies switched from negative to positive in many sections of the equatorial Pacific. This prompted the Climate Prediction Center to issue an ENSO Advisory on 9 April 1997, which stated that conditions were consistent with the onset of a warm episode. Warm (El Niño) episode conditions continued to develop from early April to early June (Figure 1). SST anomalies increased rapidly throughout the equatorial Pacific, especially near the South American coast where anomalies exceeded +4C by early June. Consistent with this anomalous warming near and to the east of the date line, enhanced convection and rainfall developed over portions of the central and eastern tropical Pacific (Figure 2). At the same time, convective activity weakened over Indonesia and sections of the eastern Indian Ocean. Also, the low-level equatorial easterlies weakened dramatically, and by early June westerlies appeared over many sec-

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El Niño

Continued from Page 5

tions. This evolution was accompanied by an eastward expansion of the western Pacific warm pool. By early June SSTs were greater than 29C everywhere from Indonesia east to near140W (Figure 3). The reduction in strength of the easterlies affects not only the local upwelling, but also the thermal structure of the upper ocean. The oceanic thermocline, a region of strong vertical temperature contrast that separates the warm water near the surface from the cold water in the deep ocean, becomes deeper than normal throughout the eastern half of the equatorial Pacific when easterlies are weaker than normal. Under normal conditions, it is the proximity to the surface of the thermocline and the nutrient rich cold water that supports an abundance of marine life near the South American coast. During warm episodes the cold water is far deeper than normal and typical fish species are absent. This also has a direct impact on the food supply for the large seabird population that inhabits this region.

SST anomalies also increased in the subtropics and lower mid-latitudes of the eastern Pacific in both hemispheres from April to June (Figure 1). Persistent weaker than normal subtropical high pressure systems to the west of Chile and California, features characteristic of warm episodes, resulted in weaker than normal coastal upwelling and the anomalous advection of tropical water into these regions.

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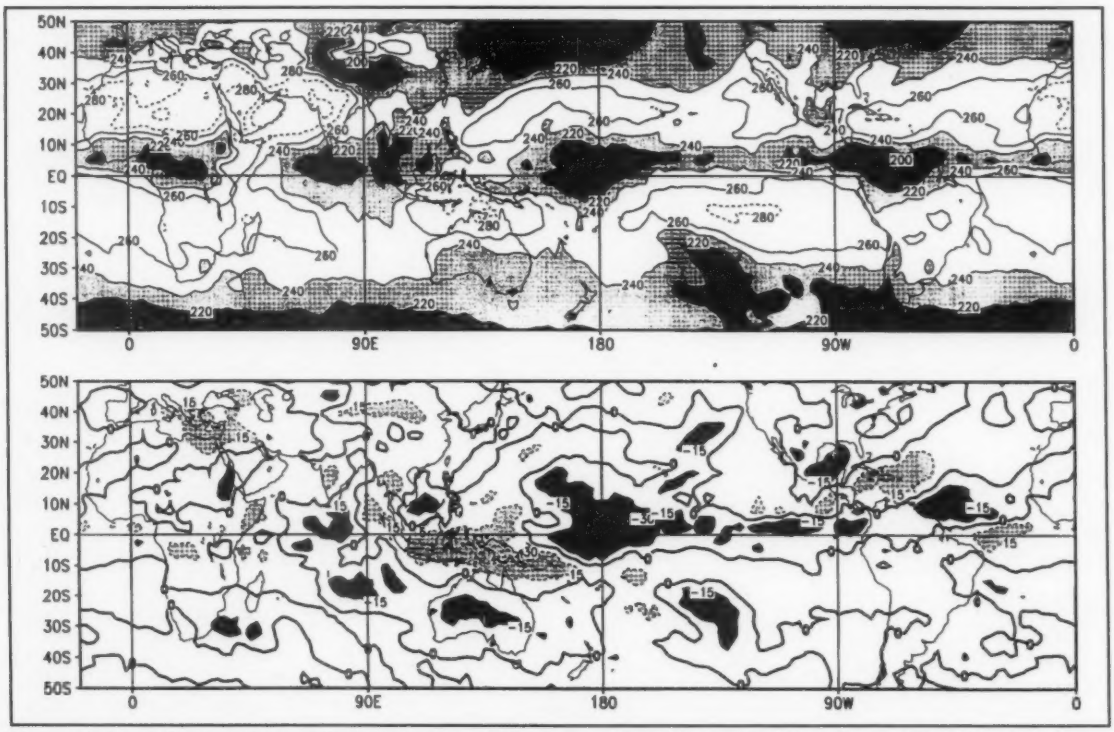

Figure 2. Mean (top) and anomalous (bottom) outgoing longwave radiation (OLR) for May 1997. OLR contour interval is 20 W m-2 with values greater than 280 W m-2 indicated by dashed lines. Anomaly contour interval is 15 W m-2 with positive values indicated by dashed contours and light shading. Anomalies are departures from the 1979-1995 base period monthly means. Negative (positive) OLR anomalies in the tropics usually indicate enhanced (suppressed) convection.

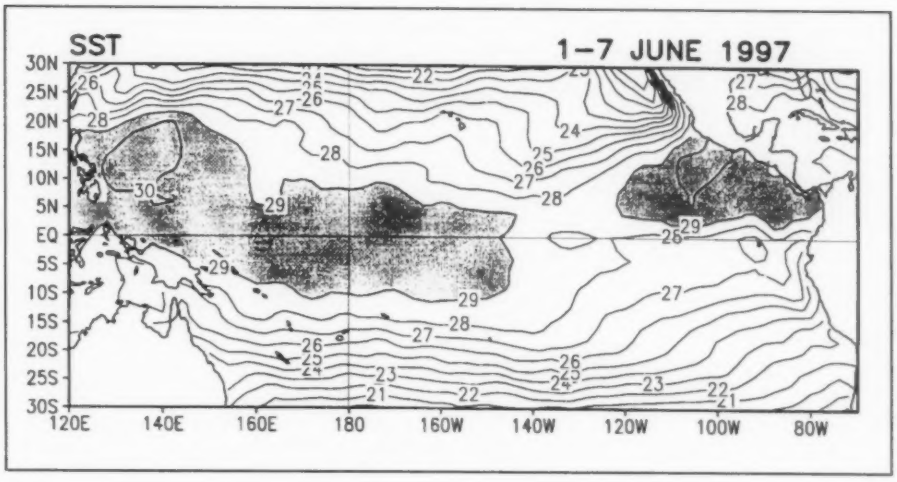

Figure 3. Sea surface temperature (C) for 1-7 June 1997. Contour interval is 1C. Shading denotes areas with SSTs greater than 29C.

El Niño

Continued from Page 6

El Niño Impacts

By studying past warm episodes scientists have discovered precipitation and temperature anomaly patterns that are highly consistent from one episode to another. Significant anomalies are shown in Figure 3 for the Northern Hemisphere winter and summer seasons. Within the tropics, the eastward shift of thunderstorm activity from Indonesia into the central Pacific during warm episodes results in abnormally dry conditions over northern Australia, Indonesia, and the Philippines in both seasons. Drier than normal conditions are also observed over southeastern Africa and northern Brazil during the northern winter season. During the northern summer season, the Indian monsoon rainfall tends to be less than normal, especially in northwest India where crops are adversely affected. Wetter than normal conditions during warm episodes are observed along the west coast of tropical South America and at subtropical latitudes of North America (Gulf Coast) and South America (southern Brazil to central Argentina).

During a warm episode winter, mid-latitude low pressure systems tend to be more vigorous than normal in the region of the Gulf of Alaska. These systems pump abnormally warm air into western Canada, Alaska, and the extreme northern portion of the contiguous United States. Storms also tend to be more vigorous in the Gulf of Mexico and along the southeast coast of the United States resulting in wetter than normal conditions in that region. Since anomaly patterns during warm episodes tend to persist for several months, accurate long-range forecasts (1 to 3 seasons) are sometimes possible for the regions shown in Figure 4. Predictions from the NCEP coupled model indicate that El Niño conditions should strengthen during the remainder of 1997.

More technical information on the global patterns of abnormal precipitation and temperature related to warm and cold episodes in the tropical Pacific can be found in Ropelewski and Halpert (1987, Mon. Wea. Rev., 115, 1606-1626), Ropelewski and Halpert (1989, J. Climate, 2, 268-284), Halpert and Ropelewski (1992, J. Climate, 5, 577-593), and Ropelewski and Halpert (1996, J. Climate, 9, 1043-1059). A general description of a warm (ENSO) episode and its composite evolution can be found in Rasmusson and Carpenter (1982, Mon. Wea. Rev., 110, 517-528). Upper-tropospheric circulation features that accompany extreme phases of the Southern Oscillation are discussed in a paper by Arkin (1982, Mon. Wea. Rev., 110, 1393-1404).⚓

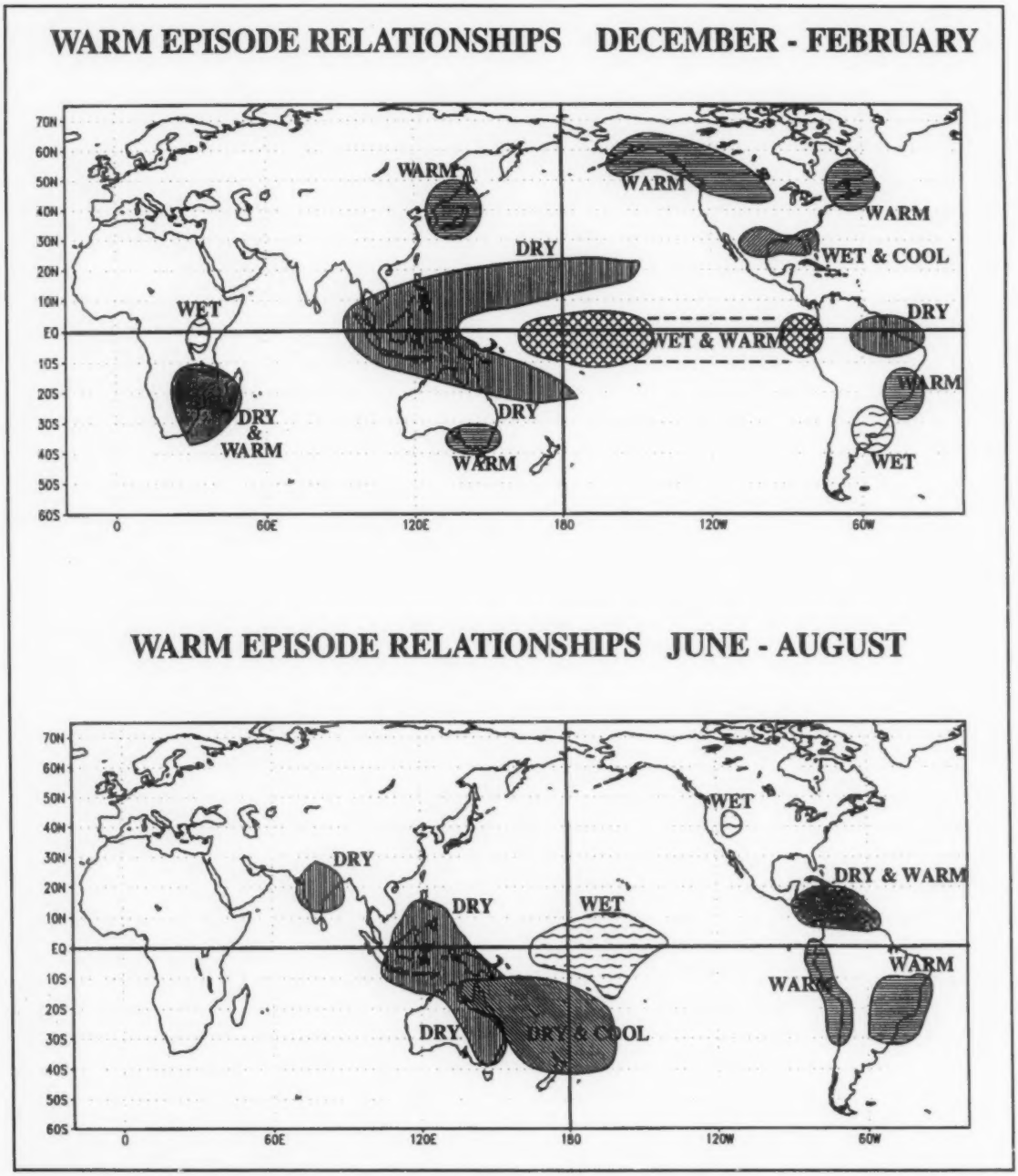

Figure 4. Typical Northern Hemisphere winter and summer anomalies associated with warm (El Niño) episodes.

Mean Circulation Highlights and Climate Anomalies

A. James Wagner
Senior Forecaster, Prediction Branch
Climate Prediction Center.

First Quarter 1997
(January–March 1997)

The pattern was quite different from that observed last year for the same season, and the corresponding seasonal climate anomalies of surface temperature were also noticeably different over both the U.S. and Europe. Middle-tropospheric heights and sea-level pressures averaged well below normal from northeastern Canada eastward across southern Greenland and the northern Atlantic to western Russia, where a strong trough prevailed in the Urals region. In the mean, the westerlies averaged both stronger than normal and faster this year than last across middle and high latitudes of the Atlantic. This resulted in rapidly-moving and often quite vigorous storm systems over the ocean, especially at high latitudes. This positive phase of the North Atlantic Oscillation (NAO) contrasts markedly with the strong negative phase that prevailed during the first three months of 1996. Except for the earlier part of the 1996-97 winter, when easterly flow brought cold continental air to western Europe, mild maritime air carried by the fast westerlies prevailed for the remainder of the season in that sector, extending eastward across much of northern Asia to Siberia. Southwestern Europe and parts of North Africa were quite cold and wet early in the winter. In contrast, mild and dry conditions prevailed for the remainder of the season beginning in February, as reflected by the strong seasonal mean ridge at both the surface and middle troposphere.

Over North America, weak blocking extended from the North Atlantic across central Canada during the first two-thirds of January, which coincided with the coldest part of the winter over the eastern U.S. After that, especially during February, the subtropical ridge became stronger than normal over the Southeast and adjacent western Atlantic, producing a mild winter and early spring in much of the eastern part of the country. The heavy snowstorms and excess cold of the previous year were almost entirely absent, and were confined mainly to some mountainous areas of the West and especially to the northern Great Plains and upper Mississippi Valley. In the latter region, early spring snowpack was the heaviest in at least two decades in some areas, putting the area at risk for serious flooding when it melted. Some remnants of blocking remained over the Bering Strait and extreme eastern Siberia. The mean high latitude circulation anomaly pattern was variable from month to month, leading to strong intraseasonal variability in some areas. A second ridge of high pressure prevailed over the eastern Pacific off California, giving a generally dry season to the Southwest. However, periods of wetness and even flooding affected sections of the Pacific Northwest, as Pacific storms breaking through to the North American continent in areas of enhanced westerly flow north of the ridge focusing moisture of subtropical origin on that region. Over the U.S. as a whole, the season was quite mild, except for the recurrent cold and snow over the northern Great Plains and upper Mississippi Valley.

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Climate Prediction Center

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Over the western and central Pacific, the jet stream was slightly south of its normal position and stronger than normal, while a weak blocking ridge prevailed at high latitudes over the Bering Sea and extreme eastern Siberia. This pattern was in evidence during each of the three months, although the location of the high latitude block shifted back and forth from Alaska to eastern Siberia.

As the season progressed, the areas of below-normal SSTs over the equatorial Pacific associated with the tail end of the recent cold phase of the ENSO that has prevailed for much of the past two years were for the most part replaced by above normal SSTs by the end of March. Warming occurred near both the coast of South America, appearing early in the season, and also near the dateline during March. The latter warming occurred because of a strong burst of low-level westerlies approaching from the western Pacific in response to the latest in a series of strong Madden-Julian Oscillations (MJO) that began early last fall. Seasons with a strong MJO have more intra-seasonal variability at middle latitudes, especially over the Pacific and North America, in response to variable forcing from the equatorial areas of the Pacific.

Second Quarter 1997
(April–June 1997)

After the fast westerlies that had prevailed at middle latitudes over much of the Hemisphere during the previous three-month season, the pattern of blocking that had been observed for much of 1996 made a strong comeback. The strongest positive anomalies in the mean were located over the North Atlantic in the vicinity of Greenland and Iceland, with other significant positive anomalies over Alaska and the Bering Sea, and over north-central Asia.

Pronounced troughs with accompanying areas of negative height anomalies were interspersed between the ridges and were located over Scandinavia and eastern Europe, a broad area of the central Pacific, and from the Canadian Maritime Provinces southward over the western Atlantic. The large area of negative height anomalies associated with the latter trough extended in an elongated band from central North America to the eastern Atlantic. The combined pattern consisting of this band of negative height anomalies located primarily between 35N and 50N and the pronounced positive height anomalies centered just southeast of Greenland represents the largest negative phase of the NAO ever observed for AMJ in a 48-year record.

Negative anomalies over both major oceans at middle and low latitudes in both the height and sea level pressure fields indicate a strong tendency for the jet streams and associated cyclonic activity to be well south of normal for the season, and in fact even south of normal for a winter season in some regions. Such a persistent anomalous pattern is usually associated with pronounced climate anomalies over both the U.S. and western Europe, and this year was no exception. Most of the area from the Great Plains to the Atlantic Coast experienced well below normal average temperatures, while parts of western Europe (especially the Iberian Peninsula) and the Pacific Northwest of the U.S., both located just east of the areas of enhanced cyclonic activity over the two oceans, experienced unusually wet conditions for this late in their normal rainy seasons.

During April, the strong mean troughs over the central Pacific and the western Atlantic were much in evidence, but the sub-tropical ridge was more amplified northward just off the Pacific Coast than in the seasonal mean. The main strength of the Atlantic ridge was located close to western Europe, which experienced a quite warm and dry month. Most of the cyclonic activity over the Atlantic was confined to the western part, where a number of intense storms kept winter-like weather over the northeastern U.S. and southeastern Canada. The ridge over Asia was most amplified at this time, giving rise to a huge area of above normal temperatures covering most of central and eastern Russia and parts of neighboring countries.

Teleconnection responses to both the above normal heights and pressures over northern Canada and off the West Coast favored below normal heights over most of the Lower 48 states. The accom-

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panying temperatures were much colder than normal over much of this area, with much of the area between the Rocky Mountains and the Appalachians experiencing April temperatures that averaged among the 10 percent coldest such months in the past century. Precipitation was relatively heavy in a band from the Rockies across the southern Great Plains and the Gulf States to the South Atlantic coast, reflecting a storm track that was well south of normal. Drier than normal conditions appeared over much of the Northeast, Ohio Valley, and Great Lakes region in response to the strengthened northwesterly flow of relatively dry continental air from Canada behind the trough just off the East Coast.

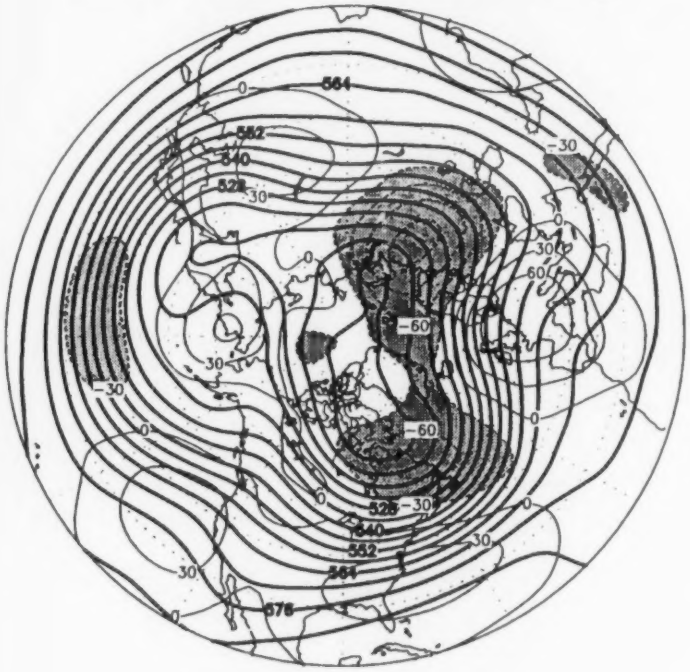
The May circulation pattern was rather similar to that for the three-month season as a whole in a large-scale sense, but details showed five separate areas with enhanced middle-latitude troughs. The additional troughs were located over the northwestern Pacific just east of the Kamchatka Peninsula and over the extreme eastern Atlantic, just west of Portugal. This latter feature was associated with the onset of the abnormal late-season rainy spell, beginning around the second week of the month. The trough over the eastern Pacific was at its strongest during May, and was locked into position by an amplified ridge to its east over the Great Basin of the American West and another ridge over southern and western Alaska, which experienced a relatively early spring. Rather warm and dry weather prevailed over the southwestern U.S. under the ridge, while the coldest conditions were limited to the Great Lakes and the Northeast, near and just west of the strong mean trough which during May was located over eastern Canada and the northeastern U.S. Dry conditions also developed over much of the middle Atlantic and south Atlantic states as strong westerly flow south of the trough across the Appalachians provided a "rain shadow" effect and kept significant moisture from the Gulf and the Atlantic away from the region.

During June the circulation took on a more zonal configuration, with above normal heights covering most of the polar region and extending southward over the North Atlantic, eastern Siberia, and across Scandinavia to central Russia. Nearly the entire area from the central Pacific to central Europe at middle latitudes was covered by zonally oriented bands of below normal heights, with accompanying cooler than normal and wetter than normal conditions. This southward displacement of the main trough activity was accompanied by an increase of heights and the appearance of dry conditions over much of eastern and central Canada, extending into parts of the northeastern U.S. and north-central U.S. Very wet weather for the season persisted over the Pacific Northwest and the southeastern states, as well as across most of Europe and western Russia. Conditions over Alaska remained warmer and drier than normal, under the influence of a lobe of the large area of above-normal heights covering most of the higher latitudes of the Hemisphere. The spring rainy season was also more pronounced and prolonged over much of China, as indicated by the stronger than normal trough in that area.

The equatorial Pacific saw a sudden and major change in conditions from the weak tail end of the previous cold phase of the ENSO phenomenon during the previous season to a rapid development of the early stages of what has already become a strong warm phase of ENSO. Although some above normal SSTs had appeared off the west coast of South America during the previous month or two, beginning in April temperatures along the equator from the South American coast to the Dateline began to rise rapidly to as much as two to four degrees C above normal by June. Many of the typical atmospheric responses quickly followed, including a drying trend over parts of Indonesia and Australia and an increase in convective activity over the eastern Pacific. The pattern of a ridge with warm weather over Alaska and the western U.S. and a trough with cold weather over the eastern U.S. with wet conditions to the south accompanying an enhanced subtropical jet stream is often a typical late winter and springtime response to the warm phase of El Niño in these regions.⚓

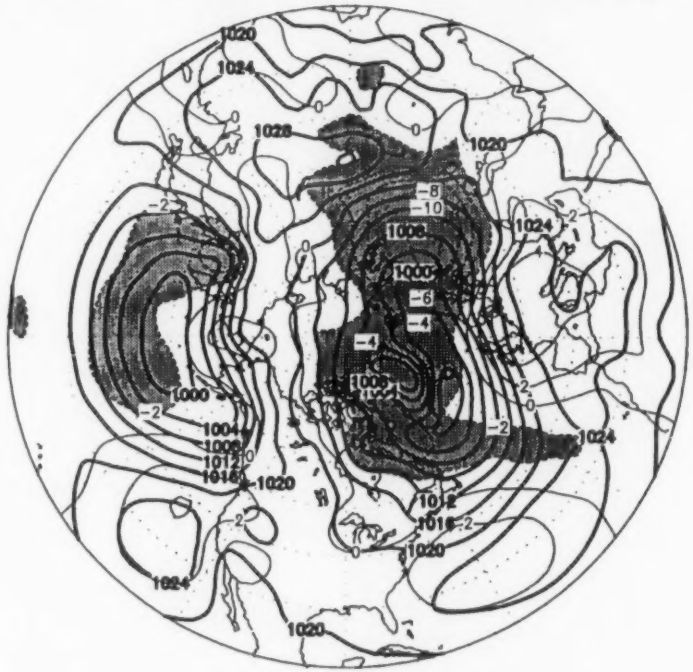
January–March 1997

500 mb Height, Anomaly



The chart on the left shows the seasonal mean 500-mb height contours at 60 m intervals in solid lines, with alternate contours labeled in decameters (dm). Height anomalies are contoured in dashed lines at 30 m intervals. Areas where the mean height anomaly was greater than 30 m above normal have light shading, and areas where the mean height anomaly was more than 30 m below normal have heavy shading

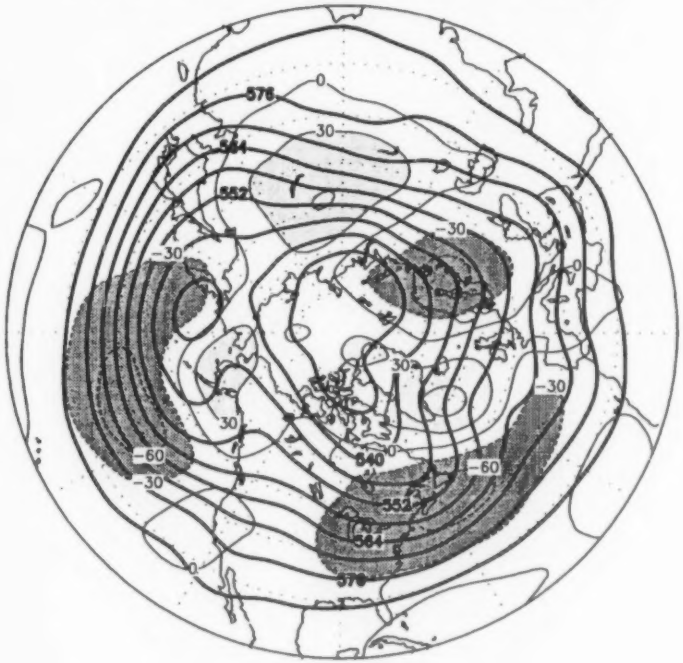
Sea Level Pressure, Anomaly



The chart on the right shows the seasonal mean sea level pressure at four mb intervals in solid lines, labeled in mb. Anomalies of SLP are contoured in dashed lines and labeled at 2 mb intervals, with light shading in areas more than two mb above normal, and heavy shading in areas in excess of two mb below normal.

April – June 1997

500 mb Height, Anomaly



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Sea Level Pressure, Anomaly

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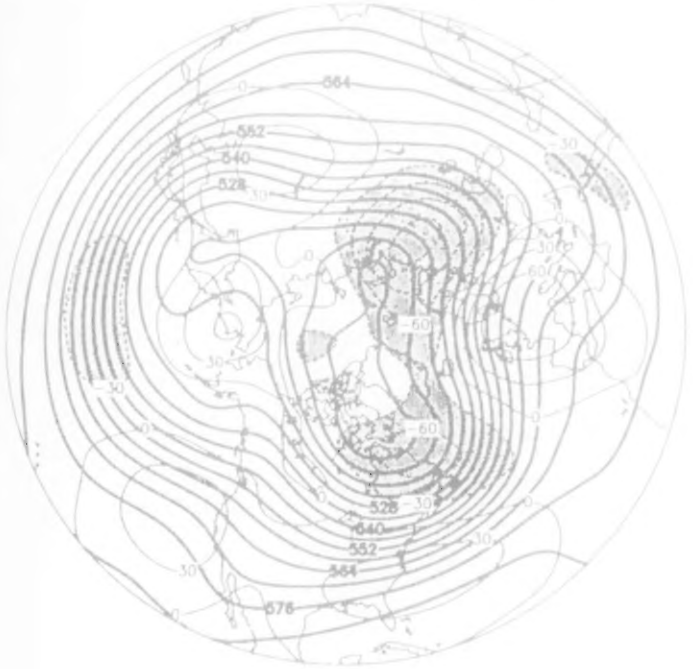
Climate Prediction Center

January–March 1997

500 mb Height, Anomaly



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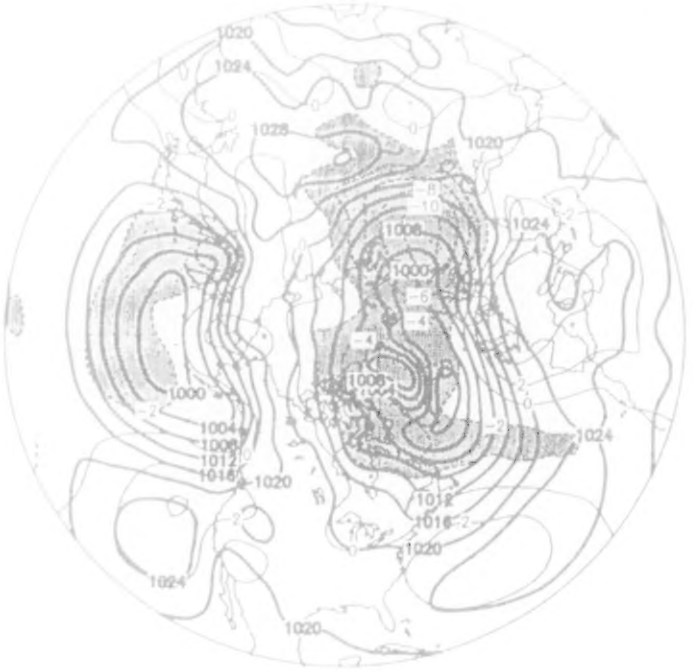

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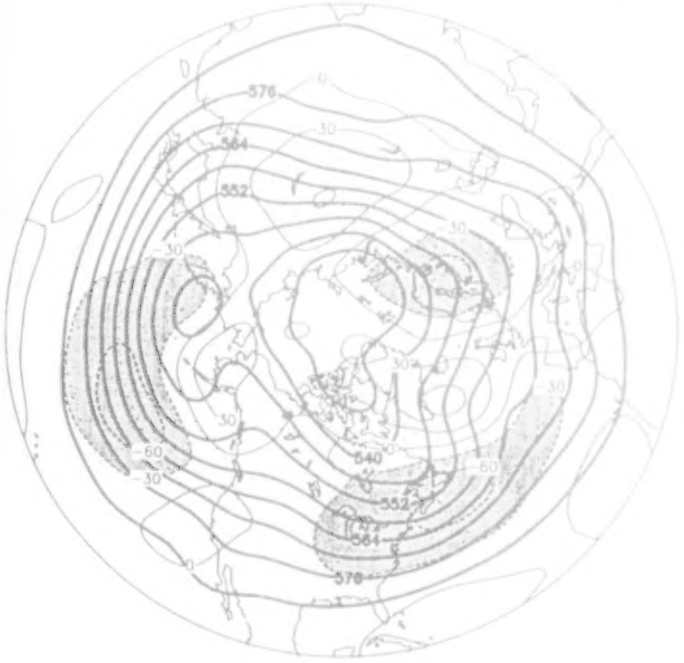

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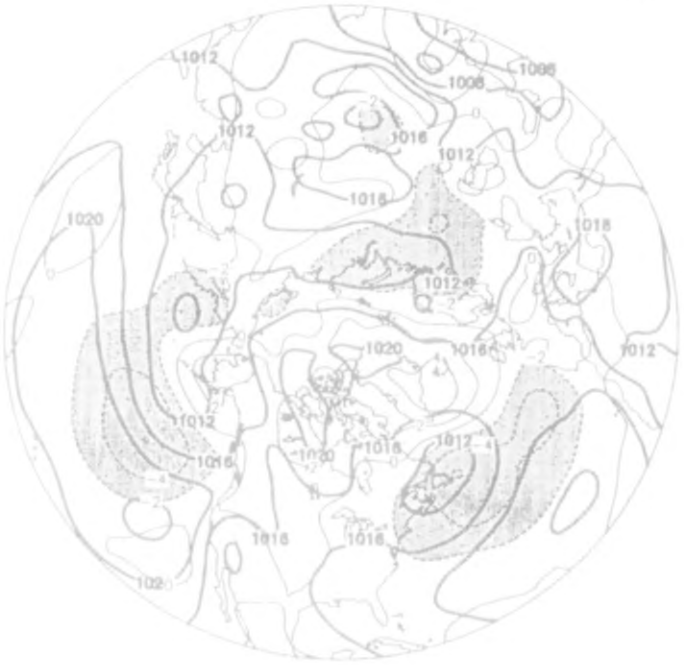
Sea Level Pressure, Anomaly



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Hurricane Hunters

Major Valerie Schmid
53rd Weather Reconnaissance Squadron
Public Affairs

Ask anyone in the hurricane hunting business why they do this job, and you'll get a response about the satisfaction in helping to save lives. That more than makes up for the rare heart-pounding adventure. Heavy rain, moderate turbulence, wild seas, and the "stadium effect" (being able to observe the goings on) all attest to the awesome power of nature, and make for an interesting ride.

While most of the experienced folks have a story or two to tell, most flights are fortunately less "exciting" than the public imagines. For the flight meteorologist, though, the missions are never boring. It is fascinating to look for the details which make each storm an individual.

The reservists who belong to the 53rd Weather Reconnaissance Squadron "Hurricane Hunters" get to see the storms evolve through all stages, as they maintain an around-the-clock vigil on tropical systems which cross 55 degrees west in the Atlantic, as well as the Central Pacific around Hawaii. The standard Alpha pattern looks like a giant X crossing the center of the storm, with a leg stretching 105 nautical miles in each quadrant of the storm. The aircraft will cross the center about every two hours to determine movement. The same pattern is repeated for continuity, usually making four fixes on a single mission. Then another of the squadron's ten aircraft will take its place on station.

All along the pattern, the WC-130's sensors feed data to on-board weather computers at a rate of five to eight times per second. Every 30 seconds, the computers create another full observation, which includes time, position, D-value (for pressure), temperature, dewpoint, wind direction and speed, and 10-second maximum wind speed. Every 20 to 40 minutes, a large chunk of these high-density observations are zapped by satellite to the NHC, where their computers plot up the data in near real-time. From this flight-level profile, the NHC Hurricane Specialists define the extent of damaging winds, and derive the strength implied by the central pressure and maximum wind data.

Other observations include the RECCO, Vortex Data Message, and Supplemental Vortex Data Message. RECCOs and dropsonde measurements are taken enroute, while the Vortex Data Message and dropsonde data are sent from the exact center of the eye. The flight meteorologist adds personal observations of the radar signature, as well as surface winds derived from the sea-state. While the high-density observations are seen only by the NHC, these other observations are disseminated to the public via the internet and standard weather networks. Decodes of these observations are contained in the National Hurricane Operations Plan, and on the Hurricane Hunter home page, **http://www.hurricanehunters.com**.

Why Fly Into Hurricanes?

In this age of satellites and tight budgets, we're sometimes asked (by folks outside of the hurricane warning community) why we risk flying into hurricanes. The answer comes tied to the tremendous economic cost of hurricane warnings, which now are estimated to cost $600,000 to $1 million per mile of coastline. This

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Hurricane Hunters

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includes the cost of shutting down commerce, lost tourism, and other preparations.

Of course, the primary concern is saving lives via the most accurate warnings. As more people continue to pour into coastal communities with limited access roads, the lead time needed for a major evacuation continues to climb. With so much at stake, any improvement in warning accuracy is a windfall.

Studies by hurricane specialists showed a 25% increase in accuracy when aircraft data were used to initialize the models, compared to satellite data alone. Further improvement will come only through better understanding and modeling of hurricane behavior, and that's where the scientists from NOAA's Hurricane Research Division (HRD) and Aircraft Operations Center (AOC) come in, flying highly-instrumented WP-3 aircraft.

Both AOC and the 53rd may fly a storm at the same time, but each has a different responsibility. While the 53rd is collecting data for immediate use in forecasts and warnings, AOC will fly different patterns for research to improve the state of the art. The 53rd flies the storms at the behest of the NHC and Congress, under an interdepartmental agreement formalized in the National Hurricane Operations Plan. The 53rd is funded by the Air Force.

New Dropwindsonde

NOAA and the National Center for Atmospheric Research (NCAR) recently developed a new dropwindsonde, which uses the Global Positioning Satallite (GPS) system to derive winds. The 53rd is now adapting this sonde, already in use on the NOAA WP-3 and G-IV aircraft. The Airborne Vertical Atmospheric Profiling System (AVAPS) will also bring several improvements to the vertical observations.

AVAPS promises a tenfold improvement in accuracy. Winds should be accurate within 1 knot, compared to the Omega's 10 knot accuracy. Temperatures will be accurate within 0.2 degrees Celsius, humidity within 2%, and pressure within 0.5 millibars, compared to the Omega sonde's 2 degrees, 30%, and 3 millibars, respectively.

The new sonde also falls twice as fast as the old one, and the number of radio receivers has been doubled, from two to four channels. These improvements theoretically quadruple the the number of sondes which could be dropped along a track, although there is the threat of swamping the operator.

The biggest challenge now is to add software to the AVAPS platform to allow inflight processing of the data. While researchers usually perform detailed post-analysis of their data, the mission of the 53rd is to provide observations in real time. The software we use now plots a mini-adiabatic chart and assists in identifying potential "wild points," which the operator deletes from the run. After the software processes the data to make thickness corrections to the height data, it also puts the data in the abbreviated code, similar to the RAOB code. With a couple of keystrokes, the message is sent via satellite directly to the National Hurricane Center. All of this takes only minutes after splashdown. Speed is secondary only to accuracy in this effort, especially when the next hurricane warning is due.

The sondes used today by the 53rd triangulate winds by tuning into several stations in the global Omega radio navigation system. The Omega network is scheduled to shut down at the end of Fiscal Year '97, and has sped up the timetable to adopt the GPS sonde. The most critical datum we provide is the central sea-level pressure, and this will be available even after the Omega network drops off line, along with the temperature and humidity profiles. In the meantime, we'll continue working to get AVAPS operational for the 1998 storm season, with the first installations by the end of this year. The two prototype systems will be flown throughout this season.

The 53rd WRS is proud to be a part of the hurricane surveillance and warning system. We will continue to fly this mission as long the return is cost-effective, in response to the national will and needs.⚓

Defining A Hurricane

Debi Iacovelli

Debi Iacovelli is a tropical weather specialist and freelance writer who lives on the west coast of Florida in Cape Coral. She is a contributor to other weather publications such as "Weatherwise," and is a founding member and tropical weather columnist for the International Weather Watcher's (IWW) publication, the "Weather Watcher Review."

The eye of a hurricane. Photo courtesy of the U.S. Air Force.

A tropical cyclone is defined as a nonfrontal low pressure synoptic scale (large scale) system that develops over tropical or subtropical waters that has a definite organized circulation. In tropical cyclones, further classification would depend largely on the wind speeds near the center of the system. The basic stages of development and criteria for tropical cyclones are as follows:

Tropical Depression: The formative stage of a tropical cyclone with rotary circulation slight or absent at the surface, but sometimes better developed aloft, no closed isobars, with maximum sustained (1-min. mean) surface winds of less than 34 kt (39 mph, 18 m/s [meters per second]).

Tropical Storm: A warm core tropical cyclone with one or more closed isobars and some rotary circulation at surface, maximum sustained surface wind (1-min. mean) range from 34 to less than 64 kt (39 to less than 74 mph, 18 to less than 33 m/s).

Hurricane: A warm core tropical cyclone with closed isobars, distinct rotary circulation, maximum sustained surface winds (1-min. mean) at least 64 kt (74 mph, 33 m/s).

The birth of tropical cyclones takes place over an area of the ocean where contrasting winds exist. In the Atlantic Basin, this is an area 50 to 100 miles wide called the "Intertropical Convergence Zone" (ITCZ). This is where the northeast tradewinds of the northern hemisphere and the southeast tradewinds of the southern hemisphere converge. Tropical systems do not develop on the equator because they require vorticity, or the twisting force of the earth's rotation, to start them spinning. Since the ITCZ moves north of the equator in the summer months in the Atlantic Basin, tropical waves start to twist to the right, and their cyclonic swirls are established.

Meteorologists agree on the following criteria as being favorable for hurricane formation:

- Sea surface temperature higher than 26 C.
- Below normal pressure (<1004 mb) in lower latitudes, and above normal pressure (>1004 mb) in higher latitudes.
- An existing tropical disturbance at the earth's surface.
- Movement of the disturbance at a speed of less than 13 knots.
- Easterly speeds decreasing in speed with height, extending upward to at least 30,000 ft.
- Special dynamic conditions in the air-flow patterns near 40,000 ft.
- Heavy rain in the area of convection.

We can define four distinct stages in the life cycle of a tropical cyclone:

1. Formative stage, which begins with a widespread area of instability when an organized wind circulation develops in a wave in the ITCZ.

2. The immature stage, when the tropical system intensifies and reaches its maximum intensity.

3. Maturity, when the storm's central pressure is at its lowest, and its intensity is starting to decrease.

4. Decay, when the system's wind speeds are less than 74 mph, the eye fills with clouds and the whole storm starts to collapse.

A unique feature of the hurricane is the eye, around which winds rotate (in the northern hemisphere) counter-clockwise. The average diameter of the eye of a hurricane is from 10 to 30 miles across. Within the eye are dramatically different conditions than exist outside the eye. Light, variable winds, minimum cloud cover, and low barometric pressure contrast sharply with the wind-driven rains, often exceeding 100 knots, outside the eye.

Hurricanes form over the tropical waters of the Atlantic, Caribbean, and the Gulf of Mexico during the hottest time of the year, with hurricane season running from June 1 to November 30. In an average hurricane season 10 tropical disturbances will grow to be a named tropical storm. Of these 10 storms, six usually intensify to hurricane strength, with the chance of one hitting the coastal U.S.⚓

Tropical Prediction Center Quarterly Column January–March 1997

Dr. Jack Beven
Andrew Shashy
Tropical Prediction Center
Tropical Analysis and Forecast Branch

I. Introduction

The weather was generally quiet in the TPC area of responsibility during this quarter. There were no tropical cyclones, and although there were many cold fronts over the western Atlantic, there were few episodes of exceptional weather. This quiet winter period is a good time to look at what TPC does after the hurricane season is over and at recent changes to Tropical Analysis and Forecast Branch (TAFB) graphic products.

II. Winter Time at TPC

The public often asks TPC personnel what they do outside of the hurricane season. The answer is: a lot! Each TPC department does much once the hurricane season is over, and in some ways the office is busier than during the season.

The post-season duties of the hurricane specialists at NHC involve reports on the past seasons, conferences with other meteorologists and emergency managers, and training sessions.

The first priority is to analyze data collected during the previous season. The end result is a series of reports (available at our Web site **http://www.nhc.noaa.gov/**) summarizing each cyclone's track, intensity, and effects. Some of this is actually done during the season, but an active season doesn't leave enough time to complete the work by November 30!

The second duty is to write a series of journal articles on the Atlantic and Eastern Pacific seasons, which is a tradition going back for about 50 years. These articles will summarize the overall season, highlighting any interesting or unusual events. They also include summaries of the individual cyclones. A third companion article summarizes tropical waves and other systems of interest. The season summary articles currently appear in *Weatherwise* and the *Monthly Weather Review*, with the tropical systems article appearing only in the *Monthly Weather Review*.

Another duty is to determine if and how the warning process broke down during the season, how to fix it if it did, or otherwise how to improve it. Three conferences play a major role here. The first is the NOAA hurricane conference, where TPC personnel meet with other National Weather Service and NOAA personnel. The second is the Interdepartmental Hurricane Conference, where NWS and NOAA personnel meet with other Federal Government departments concerned with tropical cyclones. The third is the World Meteorological Organization (WMO) Region IV Hurricane Conference, where TPC personnel meet with their counterparts in the weather services of the Caribbean and Central America. These three

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Tropical Prediction Center

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meetings allow the various organizations to develop coordinated warning and response plans for tropical cyclones.

There are two other significant conferences. The first is the National Hurricane Conference (held annually), which brings TPC personnel together with emergency managers and media representatives. The second is the American Meteorological Society Hurricanes and Tropical Meteorology Conference (held bi-annually), which brings TPC personnel together with researchers from around the world.

Another important duty is teaching and training. TPC annually hosts a WMO tropical meteorology training course for meteorologists from areas affected by tropical cyclones. It covers both theoretical and operational aspects of tropical meteorology. The short version typically lasts two weeks, while the long version lasts 10 weeks. This training involves people from all parts of TPC, as well as the Hurricane Research Division. The long version is also held in conjunction with Florida International University and Florida State University.

NHC and FEMA also participate in the training of emergency managers in hurricane situations. At times, groups of managers will come to TPC for a series of three one-week courses. At other times the hurricane specialists will travel to various coastal regions to teach.

The off-season also allows for more public relations work. There are more public tours of TPC during this time. TPC personnel also lecture in various parts of the country. When resources permit, TPC personnel tour the coastal regions on the NOAA P-3 research aircraft. This tour alternates between the Atlantic and Gulf coasts, and it allows the public a chance to learn about hurricane forecasting, research, and reconnaissance.

TAFB's base duties (marine forecasts, aviation forecasts, and graphical products) change little during the winter. While there are no tropical cyclones, there is an increase in marine (winter time gales and fog) and aviation (turbulence, icing, and fog) hazards. These keep the duty meteorologists as busy as hurricanes!

TAFB personnel also have extra duties relating to training, teaching, quality control of TAFB products, and computer system maintenance. The off-season gives the personnel more time for these duties. They also participate in the NOAA and Interdepartmental conferences, where they interact with their counterparts from other parts of the country.

TSB's base duties also change little during the winter. The off-season allows more time for computer system maintenance, developing new data sources, and developing new forecast techniques. TSB personnel also participate in training and teaching (particularly the WMO course).

Winter is also the only time TPC personnel can take normal vacations. The personnel can't be far away from the office during the hurricane season, as all hands are needed to handle an active period or a landfalling storm. Thus, the accumulated leave time must be used during the off-season.

To summarize, TPC is a bustling place in winter even without hurricanes. It sometimes gets so busy that people want the season to start just so things can quiet down.

III. Recent Changes in TAFB Graphic Products

TAFB has recently changed several of its graphic products. Here is a breakdown of the changes:

A. The Graphical Wind-Wave Forecast - New data points were added over the Caribbean and the Western Atlantic, extending the forecast into these areas (Figure 1).

B. The Gulf of Mexico Surface Product - This chart now depicts areas of fog (3 statute miles visibility or less) and significant

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convective activity in addition to the surface weather features and significant wave heights.

C. The Tropical Surface Analysis/Forecast - This chart has the greatest changes. First, it now depicts areas of significant convection. Second, it now gives a 24-hour forecast of the analyzed surface highs, lows, and fronts. Third, and most importantly, over the tropical and subtropical oceans (as well as Mexico and Central America) it has changed from a standard pressure analysis to a streamline-isotach analysis (Figure 2).

This last change requires more explanation. The pressure field over the tropical oceans is often featureless, with large areas without a single isobar (line of equal air pressure) on an analyzed map. In these areas, streamlines showing wind flow are superior in depicting weather features over the oceans. Isotachs (lines of equal wind speed) are included at 5 kt intervals where the wind is 20 kt or greater. (To avoid clutter, isotachs won't be analyzed near tropical cyclones.) These changes should give the mariner more useful information than the normal pressure analysis.

These changes will also be seen on the two sub-sectors of the Tropical Surface Analysis/ Forecast: The Atlantic Tropical Surface Analysis/Forecast and the North American Surface Analysis/ Forecast.

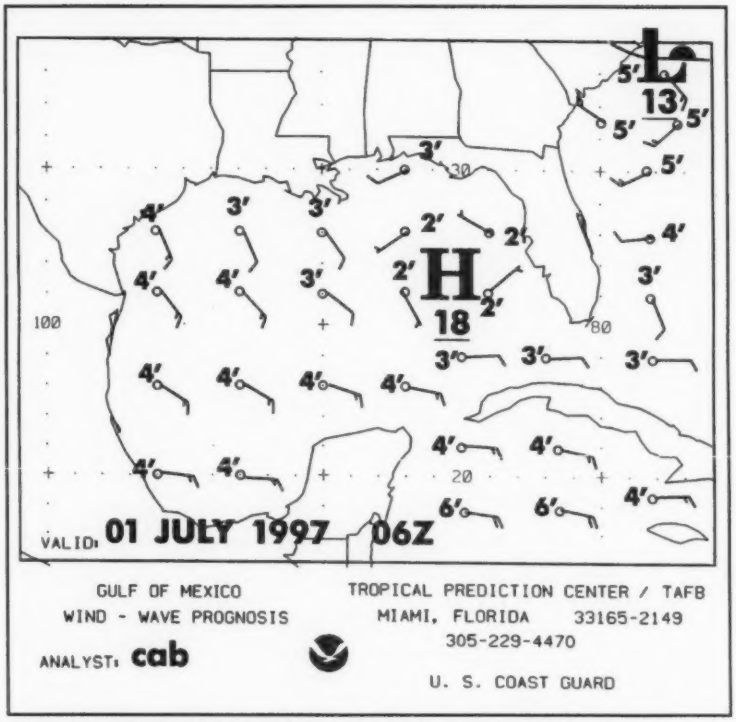

Figure 1. Typical TAFB Graphical Wind-Wave Forecast showing the distribution of data points.

TAFB is VERY interested in feedback from its customers about its products. Please direct any comments to Dr. Steve Lyons, Chief TAFB, at:

Phone: 305-229-4470
E-mail: slyons@nhc.noaa.gov
Mail: Tropical Prediction Center
11691 SW 17 Street
Miami, FL 33165-2149

IV. Significant Weather of the Quarter

A. Tropical Cyclones - There were no tropical or subtropical cyclones during the first quarter of 1997 in either the Atlantic or Eastern Pacific, and this is normal for this time of year. Since 1886, there have been four such Atlantic systems: Hurricane Alice in January 1955 (which actually formed at the end of December 1954); a January 1978 subtropical storm north of Puerto Rico; a February 1952 tropical storm in the Caribbean, Gulf of Mexico, and south Florida; and a March 1908 hurricane that moved south through the Leeward Islands. No such systems are know in the Eastern Pacific.

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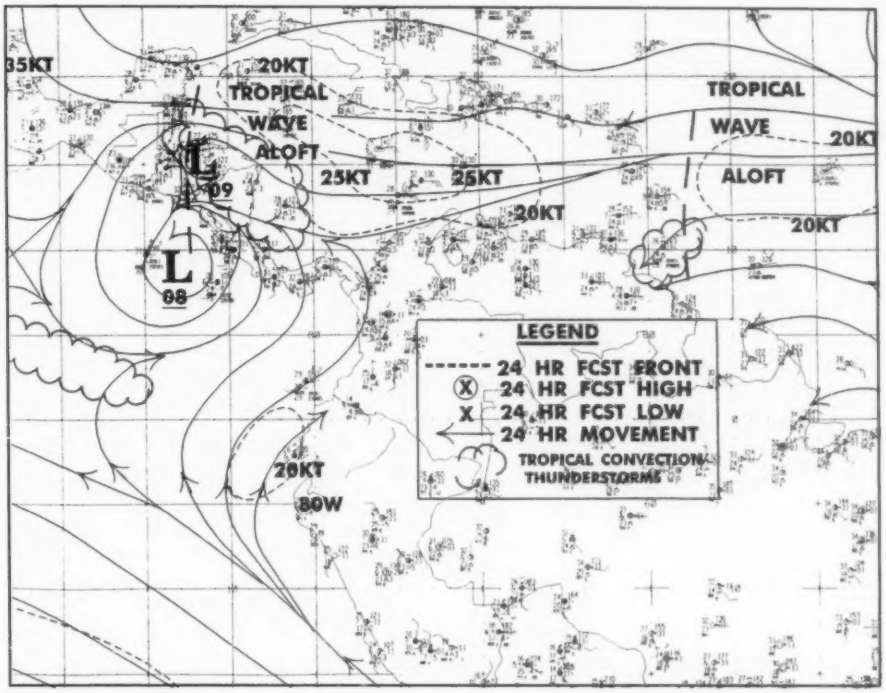

Figure 2. Example of new TAFB Streamline-Isotach Analysis.

Tropical Prediction Center

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B. Other Significant Weather - During the period from January through March 1997, there were several gale warnings in the Atlantic and Gulf of Mexico mainly associated with strong cold fronts with winds typically 30-35 kt with seas 12-16 ft. As might be expected, most of the gales associated with cold fronts occurred in January during several cold air outbreaks. However, on March 11, winds reached 40 kt with seas up to 26 ft over the central Atlantic Ocean (Figure 3). In addition, on March 15 a squall line of strong thunderstorms moved off the East Coast and continued for about 12 hours and eventually merged with a cold front. Associated winds were about 30 kt with seas to 14 ft within 400-460 nautical miles east of the squall line.

The Caribbean Sea was frequently in marine warnings as well during February and March. The Caribbean Sea has a climatological wind speed maxima in these months with average winds in the 15-20 kt range. The strong easterly trade winds in the Caribbean are due to the pressure gradient between a relatively strong high pressure ridge between 24N and 32N and a thermally induced low pressure center over Colombia. The area of concern was mainly south of 18N between 68W and 80W. Data sources, such as surface ship reports and the Special Sensor Microwave Imager (SSMI) from the DMSP satellite, frequently indicated 35 kt winds during the two months (Figure 4). However, ship reports received at TAFB were by far the most important information and were critical to issuing gale warnings. On at least one occasion, estimated winds in this area were 40 kt with seas to 18 ft. A cruise liner sailing near the area reported that several people on board the ship were injured due to rough seas of more than 12 ft.⚓

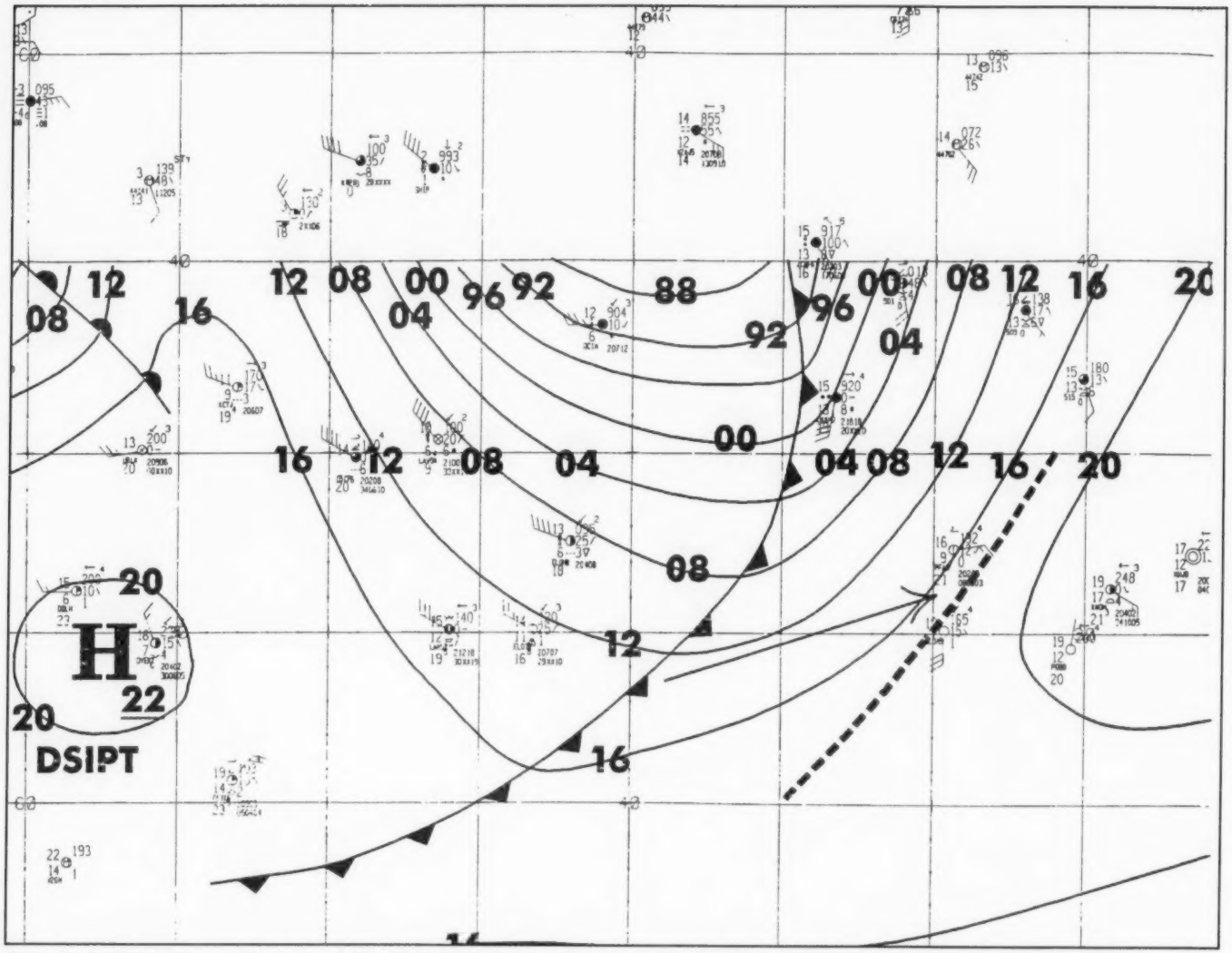

Figure 3. TAFB Surface Analysis for 0600 UTC March 11 showing strong winds behind a cold front moving into the TPC area of responsibility. Isobars are at 4 mb intervals. Latitude and Longitude lines are at 5 deg intervals.

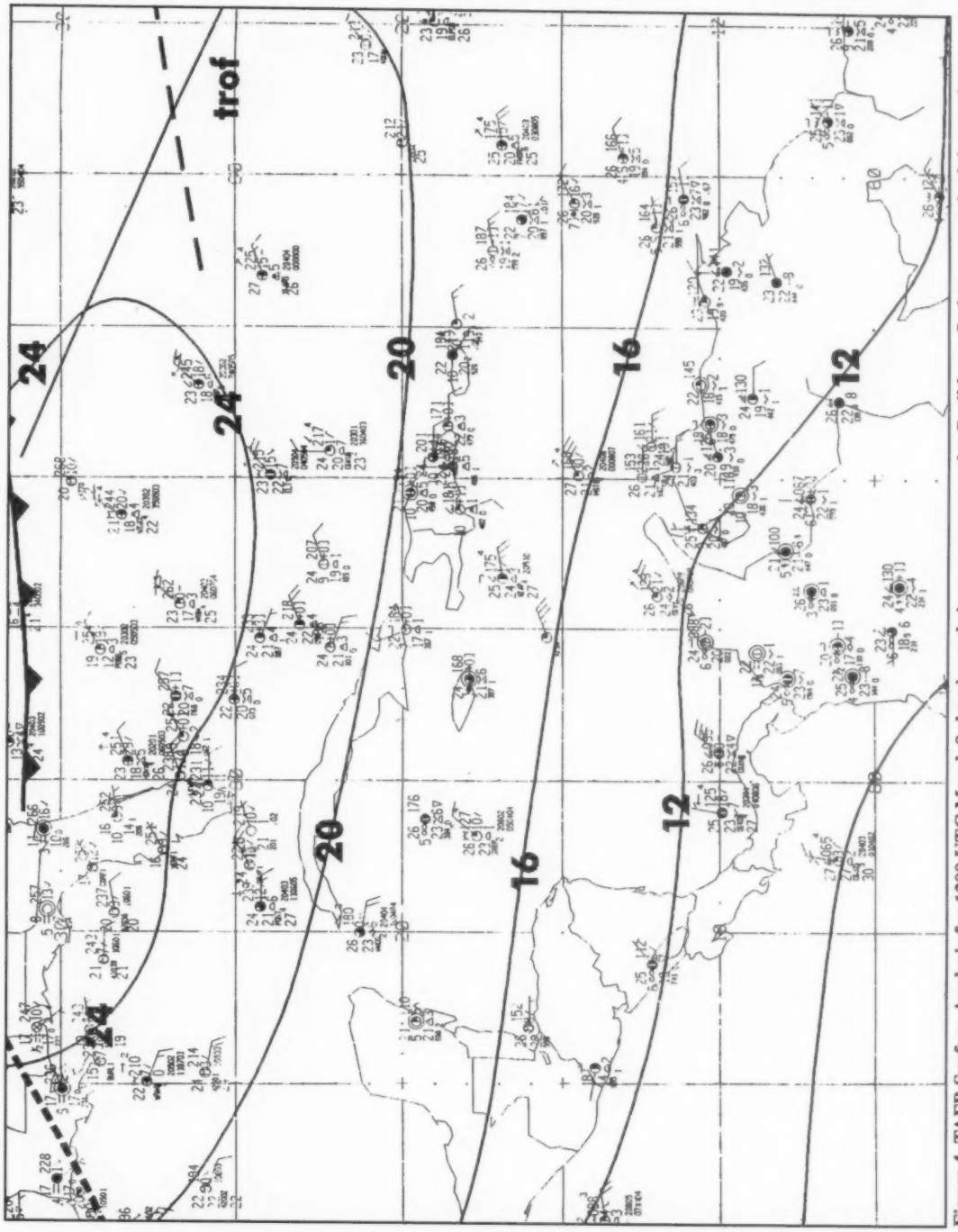

Figure 4. TAFB Surface Analysis for 1200 UTC March 9 showing gale in progress over the Caribbean. Isobars are at 4 mb intervals. Latitiude and Longitude lines are at 5 deg intervals.

Old Barney — Beacon at Barnegat Inlet

Elinor De Wire
Gales Ferry, Connecticut

When Quakers settled on New Jersey's Long Beach Island in the late 1600s, the only beacon to guide their benevolent mission of lending assistance to those at sea was the light of kindness shining in their hearts. The Society of Friends prayed for "those in peril on the sea," but earned a large part of their livelihood salvaging life and property from the many shipwrecks that occurred along their shores.

Barnegat is one of the half-dozen places along the Eastern Seaboard that lays claim to the grisly title, Graveyard of the Atlantic. As in colonial times and its early years of statehood, it remains one of the nation's most dangerous coasts, keeping the Coast Guard busy year-round. Shoals and bars extending out from its barrier beaches, odd currents and weather conditions spawned from the nearby Gulf Stream, and the prevalence of gales and hurricanes are among the perils here. Additionally, it was and remains a the major thoroughfare of shipping between important ports in New England and the mid-Atlantic.

With such a gruesome reputation, one might imagine Barnegat was one of the first places in colonial America marked by a lighthouse. Unfortunately, some two centuries passed after settlement before a lighthouse came to Barnegat. The solicitous Quakers did what they could. A privately owned beacon—probably a fire bucket mounted on a tripod—was exhibited on the beach from time to time prior to the American Revolution, but it was not until 1835 that a lighthouse was built there.

Losses from shipwrecks were numerous prior to the establishment of the lighthouse. An early colonial newspaper, the *Boston Newsletter,* gave an account of a spring storm off Barnegat:

New York, April 30. -- Yesterday came hither the masters of three sloops which were cast away near Barnegat by the late easterly storms, viz: Archibald Morris, who was bound from Pennsylvania for New York and Boston,; one Jones who was bound from Horekill to Boston; and one Saunders, bound from Roanoke to

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Barnegat Light, June 1956. Photo courtesy of R. A. De Wire.

Old Barney

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Boston. Saunders had one man drowned and saved nothing at all, and the others saved very little besides lives.

Among the most horrid wrecks was that of the *Rose-in-Bloom.* The ship left Charleston, South Carolina August 16, 1806 and was overtaken by a hurricane off Cape Hatteras a few days later. Storm winds pushed the ship northward, where it battered to pieces off Barnegat. More than half the 41 on board drowned as the hull was broken apart. Survivors floated on the remains of the hull, spars, and cargo until they were rescued by the crew of the Canadian brig *Swift,* which had encountered the tempest just south of Barnegat.

During the worst part of the storm, the *Swift's* captain, Richard Phelan, claimed a sulfurous smell pervaded the air. Lightning and thunder were intense, and rain came down in sheets. Phelan swore the devil himself was aboard ship. When the wind finally died down and skies cleared, Phelan's crew sighted the remains of the *Rose-in-Bloom* and launched the jolly boat again and again to rescue the survivors.

Wrecks occurred in calm weather as well, attesting to the dangers of Barnegat. In April 1815, the Danish schooner *Surprise* was headed to New York with veterans of the Lake Ontario campaign when it struck the shoals off Barnegat. Thirty drowned. Five years later, three vessels wrecked on these same shoals, all within a year's time and in mild weather conditions. Public demand for a lighthouse at Barnegat was loud and insistent, yet another fourteen years would pass before a government beacon was established.

Barnegat Lighthouse. Photo courtesy of the New Jersey Division of Travel and Tourism.

In 1834, several acres of beach near Barnegat Inlet, situated about 100-yards from the water's edge, were purchased from Bornt Slaught. Nathan S. Crane was contracted to build the 40-foot brick tower for $6,000. It was whitewashed to show up against the beige sands of Barnegat and showed a fixed white light produced by eleven oil lamps placed in front of reflectors.

Its first keeper, Henry V. Low, had been on duty only two years when the brig *Morgania* went aground in a storm. Barnegat's handsome lighthouse had made passage along mid-coast New Jersey safer, but it could not prevent every wreck. Low brought the *Morgania's* survivors ashore, including the skipper, who had smallpox. The lightkeeper kept the captain quarantined at the lighthouse until he recovered. Fortunately, no outbreak of smallpox in or around Barnegat occurred, and even Keeper Low escaped contracting the disease. He died the following year, however, and was succeeded by his son and daughter-in-law.

The strangest wreck that occurred off Barnegat Light was that of the *Adelaide.* The sloop struck the bar in September 1846 while trying to pass through Barnegat Inlet to take refuge from a sudden gale. The vessel capsized and all were presumed lost. When the battered hull washed ashore a short distance from the lighthouse, local residents went to see what could be salvaged. Imagine their surprise when tapping sounds came from inside the upside-down hull.

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Old Barney

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After much anguish and hard work, a hole was cut in the hull, and a lone, drenched, terrorized survivor was pulled out. She turned out to be the captain's teenage daughter. The girl eventually recovered from her ordeal and married a local fisherman.

From the beginning, navigators complained that Barnegat Light was too weak and was easily confused with other lighthouses or mistaken for a ship at anchor. "I generally steer for Barnegat, frequently passing without seeing it, owing no doubt to the low position of the light. I came very near losing my ship in consequence," said E.R. Smith, captain of the *Tropic* in the 1840s. Navy lieutenant, David Porter, noted that Barnegat Light was feeble and easily confused with a ship's light. He, and others, suggested it be made a flashing beacon.

An investigation about this same time noted that the tower was poorly constructed with inferior materials. At 54-feet above sea, and still operating an archaic lamp and reflector system, it was neither tall enough nor brilliant enough to do its job. But the Lighthouse Service was embroiled in controversy in the late 1840s, and nothing was done to improve Barnegat Light until 1855 when plans were made to build a new tower and install a stronger beacon.

Lt. George Gordon Meade, who would later distinguish himself as leader of the Union forces at Gettysburg, was at this time a respected and proven engineer with the Fourth Lighthouse District. Meade suggested Barnegat be given a first-order sentinel, due to its importance for ships from Europe making landfall at this spot before proceeding up the coast to New York. Meade's recommendation was favorably received, and he proceeded with design and construction of the new lighthouse.

But as the new tower went up, the old one collapsed, and Meade hastily erected a temporary beacon to serve until the new structure was completed. On the night of January 1, 1859 the elegant new Barnegat Light was lit for the first time. The 150-foot tower held a first-order Fresnel lens that weighed five tons and had been manufactured in France in 1847 by Henry LaPaute. Its 1,000-plus prisms and 24 flash panels gathered and magnified the light of kerosene lamps to produce a powerful beam that flashed over the sea once every ten seconds.

Meade's noteworthy engineering achievements are aptly described by Jerome Walnut in *Barnegat Lighthouse*, a small booklet produced by the Barnegat Light Historical Society Museum:

"Its twin walls of brick…were designed with an air space between to produce ventilation and a certain amount of 'give' in high winds…the cast iron stairway was installed as the walls were built, so that the inner wall fits the stairway like a jacket, and the two reinforce and support each other."

Lovely Victorian keepers' cottages were built a few years later for the station's three lightkeepers. They survived until shortly after the turn of the century, when erosion destroyed them. Erosion continued to re-shape the shoreline at Barnegat until the tower itself was threatened in the 1920s. Despite the construction of jetties and several attempts to shore up the area around the lighthouse, in 1927 the government decided to remove the lens and abandon the tower. It's beacon was replaced by a lightship, stationed a few miles offshore.

Local residents pulled together to save the aging tower by creating a breakwater of old cars. These were dumped into the inlet just off Barnegat Light in hopes they would deter the onslaught of erosion. The effort seemed to work, since the tower safe remained out of harm's way until the 1940s when the Army Corps of Engineers built two new, strong jetties and a dike.

Barnegat Light found itself at work again during World War II, but this time as a lookout tower for the Coast Guard, keeping watch for enemy submarines. At the end of the war, the lighthouse was handed over to the State of New Jersey and made the centerpiece of a park. The ecology around the tower is being preserved with special plantings and fences that slow erosion and hold the dunes in place.⚓

Real-Time Buoy and C-MAN Reports on the Internet

David B. Gilhousen
Data Systems Division
National Data Buoy Center
Stennis Space Center, Mississippi

The National Data Buoy Center (NDBC) is now posting real-time reports on a home page, **http://www.ndbc.noaa.gov/**. Posting data on the web has revolutionized the way NDBC observations are getting to the maritime public. NDBC experienced 160,000 hits (pages or files transmitted) this February, and the National Weather Service (NWS) Tallahassee home page, which has been posting NDBC reports for two years, experienced a staggering 2.6 million hits!

More than a thousand accolades were left on both home pages in the last year. Many mariners comment they always check the reports before venturing out. The U.S. Coast Guard Auxiliary reports they position search-and-rescue personnel based on NDBC reports and teach mariners how to reach our home page in safe boating classes. Several charter boat operators report they use buoy observations to help pick the day's dive or fishing site. Surfers say they surf the net first to find out whether they will find the right waves.

To obtain the latest reports from the NDBC home page, users select a station from either a map or a list under the "Real-Time Data" section. Then, a page similar to the one shown in Figure 1 will appear. It shows the latest report along with a picture of either the Coastal-Marine Automated Network (C-MAN) station or the buoy. Tables showing the last 12 hours give important trend information and a link to the latest NWS marine forecast for the station location provide expected future conditions. If users click on the plot icon next to a measurement, a time-series plot appears covering the last five days of reports.

Further down on the same page is an experimental wave product. Estimates of swell height, period, and direction follow the (overall) significant wave height. Swells are waves not produced by the local wind and come in at a higher period than waves produced by the local wind. They are estimated by an algorithm that examines the spectral wave curve which is also available. The spectral wave curve shows how the wave energy is distributed among various periods.

After the swell information, similar information is displayed about the wind-waves and an indicator of wave steepness. For a given wave height, steep waves represent a more serious threat to capsizing vessels or damaging marine structures than swell. Our indicator of wave steepness is determined by examining the significant wave height and the dominant wave period when compared with climatology.

Other sections of the home page provide a plethora of information

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NATIONAL DATA BUOY CENTER
Station Information

44014
3 meter discus buoy
Hull Number 26
Virginia Beach
DACT payload
36.58N 74.83W

The latest NWS marine forecasts (Forecast 1 and Forecast 2) are available for the area in which this station is located.

Click on the graph icon in the table below to see a time series plot of the last few days of that observation.

Conditions at 44014 as of 1600 GMT
(12:00 pm EDT) on 05/20/1997:

Air temperature:	64.4 F (18.0 C)
Water temperature:	60.1 F (15.6 C)
Atmospheric Pressure:	1009.6 mb
Pressure tendency:	-0.0 mb
Wind speed:	9 kts (5 m/s)
Wind direction:	SW (230 deg)
Wind gust:	11 kts (6 m/s)
Wave height:	5.2 ft (1.6 m)
Wave dominant period:	7 s

Previous 12 observations

MM	DD	hh	WD	WSPD	GST	WVHT	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS	PTDY
		Z		kts	kts	ft	s	s		mb	F	F	F		mb
05	20	15	SSW	11	13	5.6	7	-99	-99	1009.3	64.4	60.1	-99.9	-99	+0.0
05	20	14	SW	13	15	5.6	6	-99	-99	1009.4	64.9	59.5	-99.9	-99	+0.7
05	20	13	SW	13	15	5.2	6	-99	-99	1009.4	64.6	59.4	-99.9	-99	+0.7
05	20	12	SSW	13	15	5.2	7	-99	-99	1009.1	64.9	59.4	-99.9	-99	+0.3
05	20	11	SSW	15	17	5.2	7	-99	-99	1008.7	64.9	59.4	-99.9	-99	-0.6
05	20	10	SSW	13	15	4.9	7	-99	-99	1008.7	64.9	59.4	-99.9	-99	-0.8
05	20	09	SSW	13	15	5.9	7	-99	-99	1008.8	65.5	59.4	-99.9	-99	-1.4
05	20	08	SSW	15	17	6.2	7	-99	-99	1009.3	65.8	60.1	-99.9	-99	-1.6
05	20	07	SSW	17	19	6.9	7	-99	-99	1009.5	65.8	60.6	-99.9	-99	-1.5
05	20	06	SSW	17	19	7.2	7	-99	-99	1010.2	65.8	60.6	-99.9	-99	-0.6
05	20	05	SSW	17	21	6.2	7	-99	-99	1010.9	66.4	60.3	-99.9	-99	+0.6
05	20	04	SSW	19	21	6.9	7	-99	-99	1011.0	66.4	60.3	-99.9	-99	+1.2

Figure 1. A sample of the information available on the NDBC home page.

Real-Time Reports

Continued from Page 27

about the organization, station locations, measurement process data flow, and station status. A good starting place is to take the virtual tour. Users can then branch to pages providing station status reports, short-range service plans, station sensor heights, measurement accuracies, and data quality procedures.

The NDBC home page also serves the needs of users wanting historical data. Climatic summary graphics, such as the one shown for 41001 (Figure 2), show a frequency distribution for each measurement and month. A data availability summary gives a data inventory. Historical files containing core measurements can be downloaded for each station and year.⚓

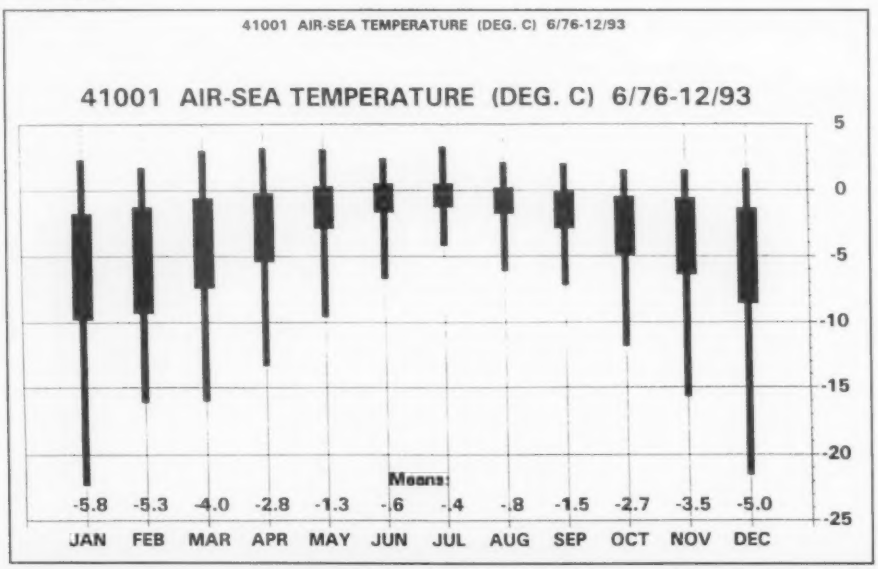

Figure 2. Climactic summary graphics showing a frequency distribution for each measurement and month are also available on NDBC's home page.

Most Notable Storms of the Previous Quarter (January 15, 1997 to April 15, 1997)

George P. Bancroft
NCEP, Marine Prediction Center

Significant Weather Event—North Atlantic

The middle of February was an active period in the North Atlantic in which a series of low pressure centers moved off the northeast coast of the U.S. and Canadian Maritimes and rapidly developed storm force winds in the Marine Prediction Center's area of responsibility. The storms then weakened as they moved into the eastern North Atlantic and approached the European coast.

The most significant of these low pressure centers is depicted in Figure 1 which covers the period of development to near peak intensity as the center was crossing 35W. The storm developed from a low depicted over northern Maine and New Brunswick at 0000 UTC 13 February. The low was associated with a 500-mb short wave trough moving through eastern Canada and the Great Lakes. The short wave lags behind the surface low, favoring development (Sienkiewicz and Chesneau, MWL, Winter 1995). Twenty-four hours later the low has deepened 17 millibars and is southeast of Newfoundland. The 500-mb short wave still lags behind but has become more V-shaped. The surface low is rapidly intensifying at this point, deepening another 24 millibars during the following 24-hour period until 0000 UTC 15 February. This qualifies it as a meteorological "bomb," labeled as "RAPIDLY INTENSIFYING" on MPC surface analysis charts.

The surface low is shown near maximum intensity at 0000 UTC 15 February as it crosses 35W with a central pressure of 969 mb. At this point the system is more vertically stacked with the 500-mb short wave trough which is shown developing a closed center. There are several ship reports with storm

Continued on Page 31

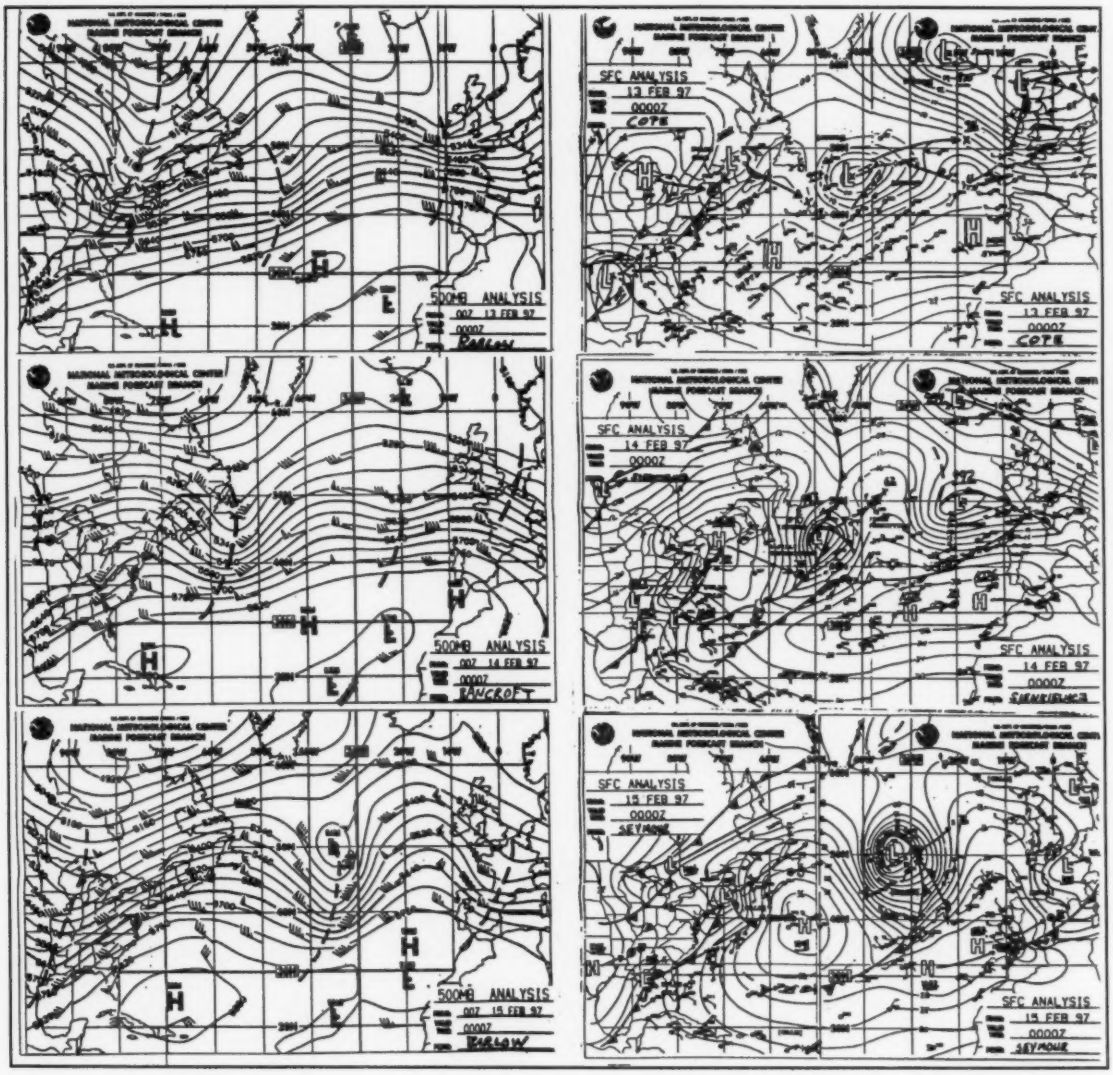

Figure 1. Three panel diagram showing the 500-mb analyses and short wave trough axes (dashed line), and surface pressure analyses for (a) 0000 UTC February 13, (b) 0000 UTC February 14, and (c) 0000 UTC February 15, 1997.

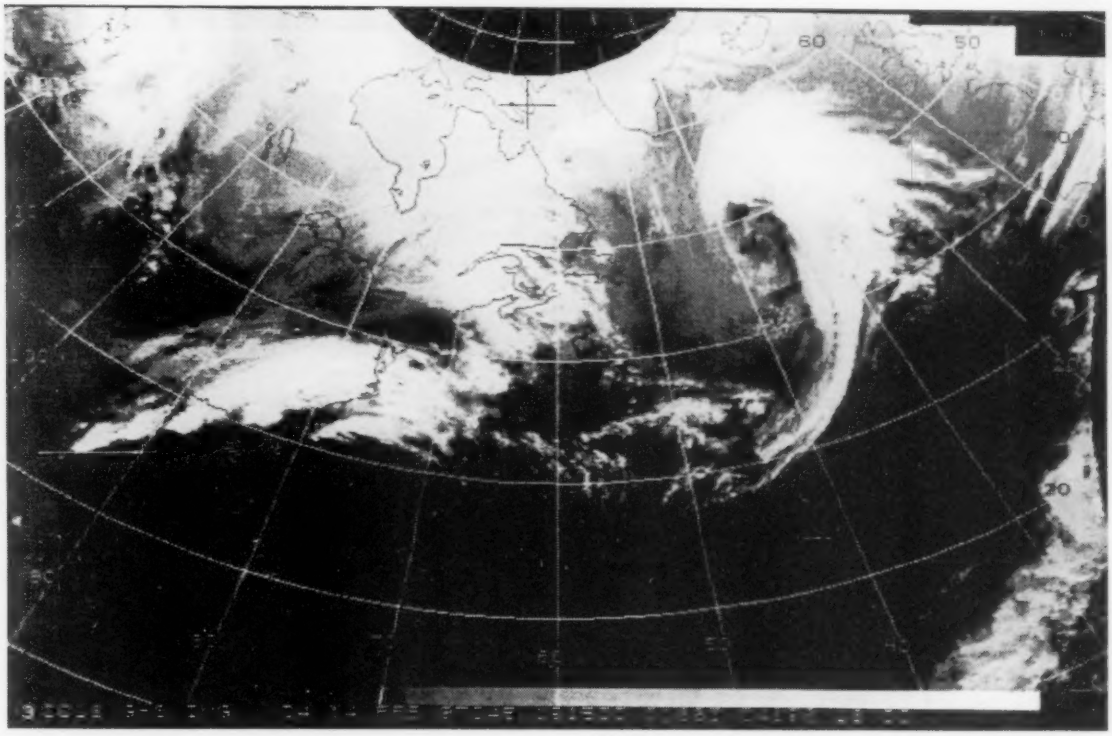

Figure 2. GOES-8 unenhanced infrared satellite image at 1915Z 14 February showing storm near maximum intensity with center near 47N 37W.

Notable Storms

Continued from Page 29

force winds of 50 kt or more behind the cold front on the back side of the storm center, including an 80 kt report. This was the only report of winds that high received during the winter of 1996-97. Such reports are rare over the open ocean outside of tropical cyclones. Figure 2 is a GOES-8 infrared satellite image from 1915 UTC 14 February showing the storm several hours before the analysis time of 0000 UTC 15 February (Figure 1) near maximum intensity. Note the higher clouds with cold tops depicted as whiter colors in unenhanced infrared imagery tending to wrap around the center near 47N 35W, a common feature of intense lows. Also, cold unstable air is shown on the back side of the storm as a gray color (stratocumulus type clouds) or a more broken white color (cumulus type with more vertical development and possible showers) near 40N 40W. The cold air hits the warm Gulf Stream in this area.

Figure 3 is a three-panel display of operational sea state analysis charts issued by MPC for their radiofacsimile schedule, showing the rapid development of the seas south and southeast of Newfoundland associated with the developing storm. On the first two panels an older sea state maximum of 9.5 meters associated with a preceding storm is shown moving east toward Europe. Maximum seas shown on the analysis charts reached 12 meters (40 feet) southwest of the storm center. However, there was a ship report of 16 meters (53 ft) at 0600 UTC

Continued on Page 32

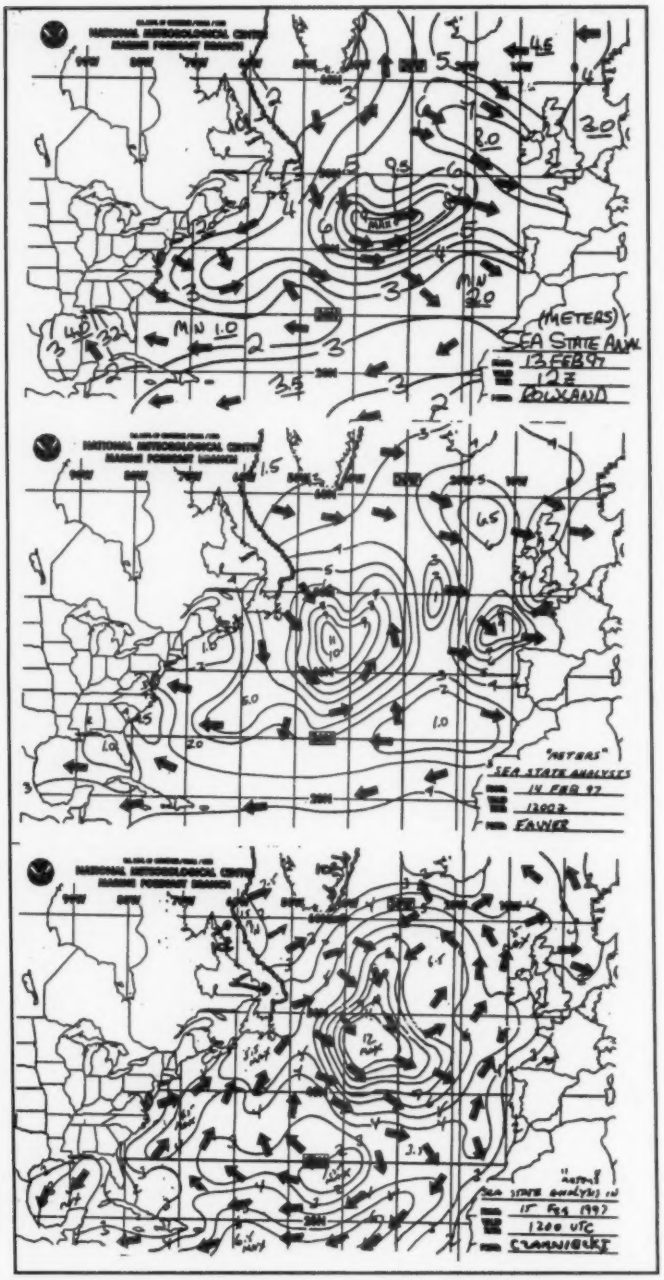

Figure 3. Three panel diagram showing sea state analyses for the North Atlantic for (a) 1200 UTC February 13, (b) 1200 UTC February 14, and (c) 1200 UTC February 15, 1997.

Notable Storms

Continued from Page 31

15 February (not shown) which is six hours after the analysis time of the third panel of Figure 1.

The storm subsequently weakened as it moved into the eastern North Atlantic. It was not only moving away from the long wave trough position over the western Atlantic (with the main center west of Greenland), but it was moving through a long wave upper ridge shown in Figure 1 over the eastern North Atlantic.

Significant Weather Event—North Pacific

Early February was an active time in the central and western North Pacific in which a series of lows moved east from near Japan and then rapidly intensified and turned north toward the Aleutians. One of these, described in this article, developed hurricane force winds and attained an intensity which is unusual for such low latitudes.

Figure 4 depicts the development of this storm from its initial formation as a frontal wave southeast of Japan to maximum intensity as it was turning north past 40N latitude toward the Aleutians. The corresponding 500-mb analysis charts are shown along with short wave troughs. A broad upper low covered the area from the western Aleutians and southwest Bering Sea westward, with the main upper low center in

Continued on Page 34

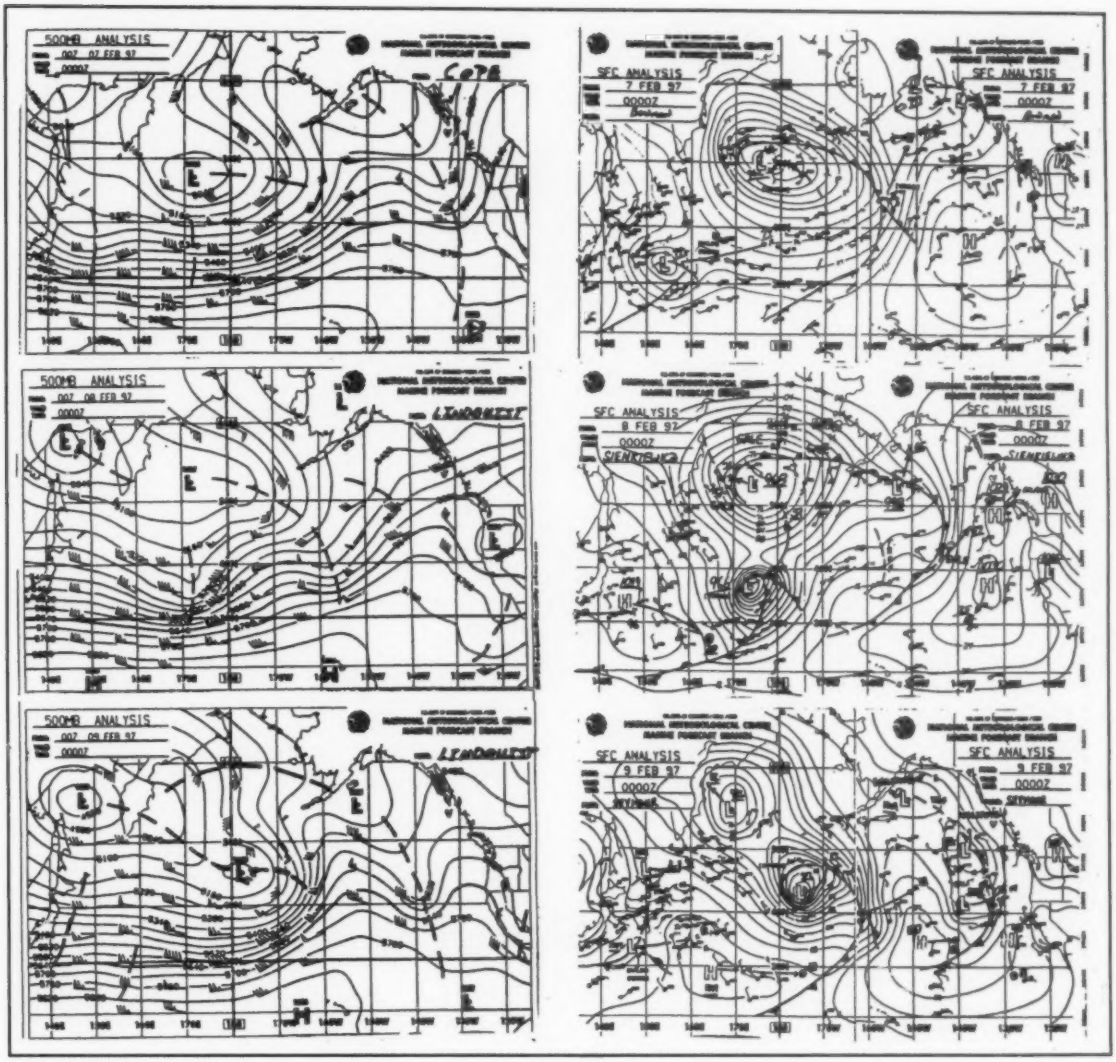

Figure 4. The three panel diagram shows the 500-mb analyses and short wave trough axes (dashed line), and surface pressure analyses for (a) 0000 UTC February 7, (b) 0000 UTC February 8, and (c) 0000 UTC February 9, 1997.

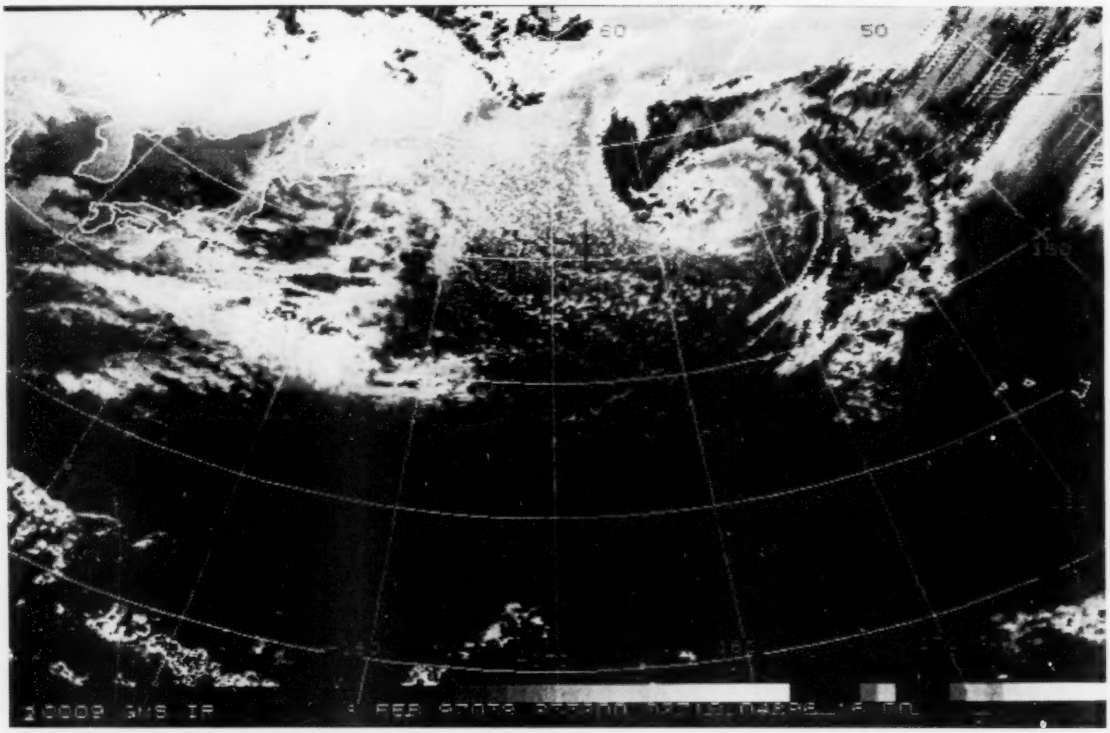

Figure 5. A GMC enhanced infrared satellite image for 2332 UTC 8 February 1997 depicting the storm near maximum intensity near 43N 173W.

Notable Storms

Continued from Page 32

the Sea of Okhotsk. The short wave supporting initial development is shown near 150E east of Japan. As this moves east it sharpens and becomes more V-shaped as it comes more into phase with the long wave trough to the north. Then, by 0000 UTC 09 February the short wave amplifies more and actually closes off at 500-mb. The short wave development supports the rapid deeping of the surface low east of Japan during the first 24 hours to a storm by 0000 UTC 08 February with 966 mb central pressure. The 26 millibar drop in pressure of the surface center qualifies it as a meteorological "bomb," denoted on MPC surface analyses by a "RAPIDLY INTENSIFYING" label. The storm is shown at maximum intensity, 951 mb, on the third panel of Figure 4 for 0000 UTC 09 February.

Figure 5 is a GMS satellite image of the storm near maximum intensity with the center near 43N 173W. The colder cloud tops associated with the deep layered cloud band north and east of the cold front and wraparound occlusion are computer-enhanced. It is interesting to note the ring cloud surrounding the center. This satellite feature can be found in very intense lows.

The second and third panels of Figure 4 show several ship reports of 50 to 55 knots south and southwest of the storm center. These were outside the area of tightest analyzed pressure gradients. At 0600 UTC 08 February there was a ship report with 65 knot west winds closer to the

Continued on Page 35

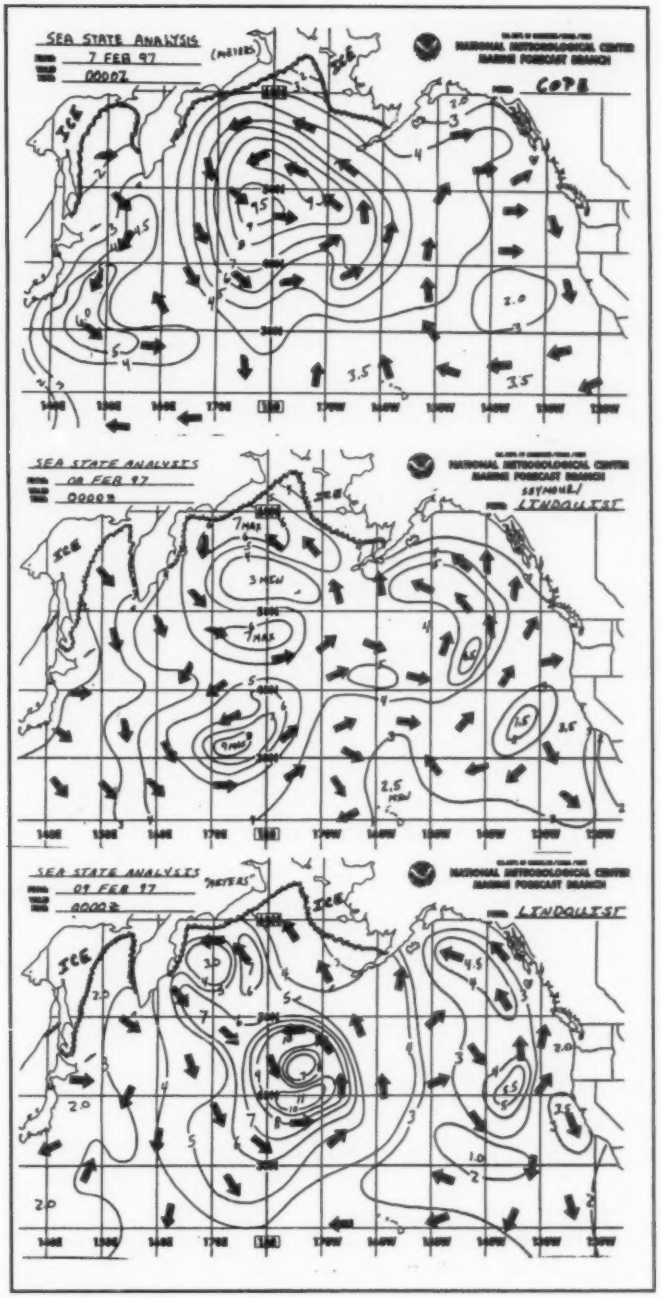

Figure 6. The three panel diagram shows sea state analysis charts for (a) 0000 UTC 7 February, (b) 0000 UTC 8 February, and (c) 0000 UTC 9 February, 1997.

Notable Storms

Continued from Page 34

storm center, south of the center near 35N (not shown). This was 6 hours after the analysis time of the second panel of Figure 4. Figure 6 shows the development of the seas around the storm in a three panel display of sea state analyses at times corresponding to those in Figure 4. A 6 meter sea height maximum southwest of the center on the initial panel grew into a 9 meter maximum on the second panel at 0000 UTC 08 February. Then, at 0000 UTC 09 February, with the storm at maximum intensity, seas of 9 to 11 meters were analyzed around the south, west, and north sides of the storm. At 0600 UTC 08 February, the same ship that reported 65 knots, mentioned above, also reported seas of 14 meters (46 ft).

The storm subsequently turned more north and began to weaken, like its predecessor which was analyzed as a gale near the western Aleutians at 0000 UTC 08 February and over the western Bering Sea at 0000 UTC 09 February (Figure 4).

References

Sienkiewicz, J. and Chesneau, L., 1995: "Mariner's Guide to the 500-Millibar Chart," *Mariners Weather Log*, Winter 1995.⚓

MPC Now Producing Offshore Forecasts

National Weather Service warnings and forecasts for the offshore waters of the mid-Atlantic, New England, and West Coast states now originate from its Marine Prediction Center in Camp Springs, Maryland. The change became effective on June 10, 1997.

Until that date, warnings and forecasts for the coastal waters from approximately 60 to several hundred nautical miles offshore had been issued by local forecast offices in Taunton, Massachusetts; Sterling, Virginia; Seattle, Washington; and Monterey, California.

The transfer of the offshore forecasting responsibilities is part of the National Weather Service's (NWS) overall modernization program. As the agency moves to a streamlined field structure at fewer locations, forecasters at the modernized field offices will focus their time and resources on severe weather impacting the local community, with support from NWS centralized operations as needed. Marine forecasts for the immediate coastal areas out to about 60 nautical miles will continue to originate from the local weather forecast offices.

"The marine community has been served very well by the dedicated staffs of the field offices and we intend to uphold that tradition of excellence," said James Hoke, director of the Marine Prediction Center. "Consolidating the offshore forecasting responsibilities at a national center has the potential for improving forecasts because of the increased observational and model data available to the marine forecasters there."

"Customers including commercial and recreational boaters, fishermen, and many others in the marine community will benefit from having forecasters and a national center dedicated solely to marine weather services," added Hoke.

The Marine Prediction Center analyzes and forecasts conditions for the North Atlantic and North Pacific oceans, including winds, waves, fog, and ice accretion. Operating 24 hours a day, the center originates and issues high seas marine warnings and forecasts, continually monitors and analyzes maritime data, and provides guidance of marine atmospheric variables for purposes of protection of life and property, safety at sea, and enhancement of economic opportunity.

Formed in October 1995, the Marine Prediction Center also produces marine forecasts in response to emergency situations identified by NWS forecast offices, the Federal Emergency Management Agency, and the U.S. Coast Guard, including its Search and Rescue mission.

The offshore forecast products will be available through the NWS dissemination systems. Additional information on the Marine Prediction Center is available on the Internet at **http://www.ncep.noaa.gov/MPC**.

Note: All NOAA press releases, and links to other NOAA material, can be found on the Internet at **http://www.noaa.gov/public-affairs**.⚓

AMVER Program

PA3 Sebastian G. Warren
United States Coast Guard
AMVER Maritime Relations

Typhoons

The South Pacific is known for having some of the most beautiful islands in the world. Isles like Fiji, Borneo, the Philippines, Guam, Thailand, New Zealand, and Hawaii are some of Mother Nature's greatest tropical creations. However, for all the beauty this region possesses, there is also ugly danger—typhoons.

Between September and March, the South Pacific is known for the typhoons that devastate the region. Carrying minimum force winds of 74 mph, these tropical cyclones make the South Pacific one of the most dangerous areas of ocean for mariners. They are to the Pacific Ocean what hurricanes are to the Atlantic. Fortunately, standing always ready to assist troubled mariners in adverse weather is the U.S. Coast Guard's Automated Mutual-assistance VEssel Rescue (AMVER) computerized safety network.

In 1996, the AMVER system was used approximately 209 times to divert merchant vessels to assist in distress alerts. Forty-eight out of 129 documented lives saved by the AMVER network last year were in the South Pacific Ocean region. However, not all cases were because of typhoon-related weather. The intense fury typhoons create have caused misfortunes for some mariners in the Pacific.

Recently, eight passengers of the tug boat *Mr. Bill* were rescued by the crew of the *Mekhanik Ilchenko*, a 526-foot Maltese-flagged motor tanker. Three hundred-fifty miles off the coast of Guam the tug began taking on water after violent seas and strong winds caused by Typhoon Fern. A 35-ton hydraulic crane broke free from the deck causing structural damage to the starboard side of the tug. The crew and passengers abandoned ship and waited in the heavy weather for help to arrive.

The Stevens family of four was saved by an AMVER-enrolled vessel after the family's newly purchased sailboat, the *Namfon*, suffered structural damage during Typhoon Orson. A large wave rolled their boat causing the rudder to loosen and fall off. After days of trying to save the boat and sail home with a makeshift rudder, they were forced to abandon it due to reports of more ominous weather approaching. The *Nada V*, a 514-foot Panamanian-flagged auto carrier arrived on scene, recovered the family, and brought them to shore.

Early last year, a retired U.S. Navy Captain had to be rescued by an

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AMVER Program

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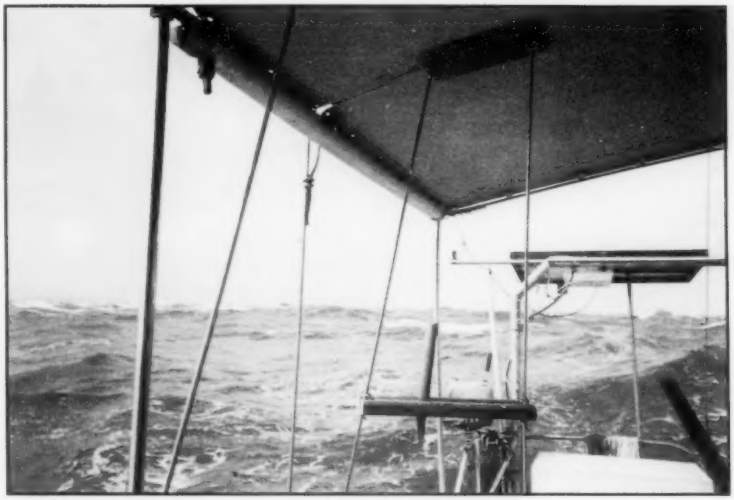
AMVER ship from the remnants of a typhoon when his boat began taking on water. A power failure on board disabled his boat's bilge pump while sea waves, agitated by the weather, leaped over the side of his helpless vessel, flooding the bilges. The *Gao He*, a 770-foot Chinese-flagged container ship, was diverted by AMVER to recover Radican.

The U.S. Navy's Military Sealift Command had two ships perform the most dramatic rescue of the year. The *USNS Kilauea* and *USNS Zeus*, recovered 20 crewmen after Typhoon Dale sank their ship, the *Guernsey Express*, southwest of Guam. The 229-foot Philippine-flagged specialized cargo vessel was overwhelmed by the 40- to 50-foot seas that caused flooding in their ship. All crew members were recovered; however, two were injured and taken to the hospital.

Mother Nature is not always kind, and typhoons appear to be nothing more than a mother's child throwing an ugly tantrum amongst the beauty of the South Pacific. And as long as mariners need help at sea, AMVER will always be there.

For more information, contact:

AMVER Maritime Relations
U.S. Coast Guard Battery Park Building
New York, NY 10004-1499
Phone: (212) 668-7764
Fax: (212) 668-7684
E-Mail: ActNY/AMR⚓



Waves from Typhoon Fern approach the *Namfon*.

Stevens family members climb the accommodation ladder to the *Nada V* leaving the rudderless *Namfon* after Typhoon Fern left them adrift.

Photos courtesy of the Stevens family.

Voluntary Observing Ship Program

Martin S. Baron
National Weather Service
Silver Spring, Maryland

Common Observer Errors

Most reports received from VOS program vessels are error free. However, errors are occasionally noted. The most common errors are:

(1) Mistakes in the reporting of dewpoint temperatures.
(2) Erroneous ship's position information.
(3) Day/time group errors.
(4) Improperly coded visibility.
(5) Errors in the reporting of pressure tendency and characteristic.

(1) Use The Dew Point Calculation Table Properly

Dew point temperature errors often result from incorrect use of the dew point calculation table, in particular using dry bulb rather than wet bulb for the horizontal rows of the table. Remember that each horizontal row of the dew point calculation table corresponds to a value for wet bulb temperature, and each vertical column corresponds to a value for wet bulb depression (wet-bulb temperature minus dry bulb temperature).

Using the wrong value for sign, S_n, is another error sometimes seen in dew point temperatures. Remember, S_n is coded as 0 for positive or zero dew point temperature, and as 1 for negative dew point temperature.

(2) Determine Quadrant, Latitude, and Longitude Correctly, and be sure to code these properly.

Quadrant (Q_c), latitude ($L_aL_aL_a$) and longitude ($L_oL_oL_oL_o$) must be accurate. Longitude is reckoned from the Greenwich and 180th Meridians, latitude from the equator. Be particularly careful near quadrant boundaries, especially when your vessel crosses from one quadrant to another. Remember, for north latitudes, Q_c is coded as 7 for west longitude, or as 1 for east longitude. For south latitudes, Q_c is coded as 5 for west longitudes, or as 3 for east longitudes. If your ship is right on the Greenwich or 180th meridian ($L_oL_oL_oL_o$ = 0000 or 1800 respectively), you may code Q_c as either 1 or 7 for the northern hemisphere, or 3 or 5 for the southern hemisphere (the choice is left to you). If your vessel is right on the equator ($L_aL_aL_a$ = 000), Q_c = 1 or 3 (eastern longitude), or 5 or 7 (western longitude). Again, the choice is left up to you.

When your vessel crosses the equator, the greenwich, or 180th meridians, you must change Q_c to

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VOS Program

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the appropriate code. Otherwise, your ships position will not be correctly described.

Both latitude and longitude are coded in degrees and tenths. To change minutes to tenths of degrees, divide minutes by 6 and disregard the remainder, i.e., 45 minutes is 7 tenths of a degree, 30 minutes is 5 tenths of a degree, 05 minutes is 0 tenths of a degree, etc.

(3) Reckon Day and Time by Universal Time Coordinated (UTC).

Don't forget to change the day at 0000 UTC. The day of the month (YY) and time of observation (GG) are determined according to UTC, not by local date/time.

(4) Code Visibility By Referring to The Visibility Code Table.

When reporting visibility (VV), permissible code values range from 90 (for visibility less than 55 yards (50 meters)), to 99 (for visibility greater than or equal to 27 nautical miles (50 kilometers)). Some visibility reports are coded outside the valid range, probably because the observers are reporting visibility in nautical miles, forgetting to use the code table.

(5) Distinguish Pressure Tendencies of "Steady" and "No Net Pressure Change".

When reporting 3-hour characteristic of pressure tendency (a) and amount of pressure tendency (ppp), remember that code 4 for (a) means the pressure has not changed at all during the 3-hour period (pressure has been steady with a flat or horizontal barograph trace). Under this circumstance, appp is always coded as 4000 (ppp = 000 for net 3-hour pressure change of 0). In fact, whenever a is coded as 4, ppp must be coded 000. However, if pressure has risen, and then fallen during the 3-hour period, use a = 0, even if the net pressure change has been 0. If pressure has fallen, and then risen, use a = 5, even if the net pressure change has been 0. See the code table for (a).

New PMO For Newark, New Jersey

We are pleased to announce that James McLain is the new PMO for Newark, New Jersey. Jim has spent much of his career with the U.S. Air Force, retiring in 1984 as the military training advisor to the Air National Guard Weather Flight at Mansfield, Ohio. He then worked for the Air Force as a civilian Supervisory Meteorological Technician in Columbus, Ohio. In 1988 he began working as a weather forecaster for the U.S. Army at the Aberdeen Proving Grounds in Maryland. He came to work for the National Weather Service at Cape Hatteras, NC in 1989, providing weather support for the outer banks and coastal North Carolina. IN 1991, he transferred to the NWS Test and Evaluation Branch at Sterling, VA., performing test and evaluation services on equipment and software.

Please note that PMOs Newark and New York (Tim Kenefick) have the same phone number (201-645-6188). They share facilities at Building 51, Newark International Airport, and are working together to cover the vast port of New York/New Jersey. Tim primarily covers the ports on the New York side, with Jim mainly taking the New Jersey port areas, but there is much overlap. Don't be surprised to see Tim visiting ships in New Jersey and Jim in New York.

PMO Conference Calls

We are having monthly PMO conference calls to coordinate VOS program activities. Everyone dials an 800 number for participation over the phone. Discussion topics are diverse and cover a wide range of issues of interest to PMOs and the VOS program.

Please let your PMO know about any problems or special requirements you may have. These will be discussed and dealt with during the monthly conference.

Errata

The following 15 vessels received VOS program awards for 1996 but were inadvertently not included in the awards list published in the last VOS program column (Fall 1996/Winter 1997 MWL). A total of 53 vessels received awards (not 38 as reported). My apology for the omission. Congratulations to all vessels receiving the 1996

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VOS Program

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awards for their outstanding cooperation and support in the VOS program.

D. G. Columbia
Direct Kiwi
Delaware Trader
Manoa
Maui
Mayaguez
NOAA Ship Ferrel
Nedlloyd Montevideo (formally Monterrey)
Sealand Enterprise
Sealand Navigator
Sealand Pacific
Sealand Trader
Sea Lion
Sea Merchant
Sedco BP471

New Recruits — April - June, 1997

During the 3-month period ending June 30, 1995, PMOs recruited 34 vessels as weather observers/ reporters in the National Weather Service (NWS) Voluntary Observing Ship (VOS) Program. Thank you for joining the program.

Please follow the worldwide weather reporting schedule as best you can—report weather four times daily at 0000, 0600, 1200, and 1800 ZULU or UTC time. Also report weather once every three hours when within 300 miles of named tropical storms and hurricanes. The United States and Canada have a 3-hourly weather reporting schedule from coastal waters out 200 miles from shore, and from anywhere on the Great Lakes. From these coastal areas, please report weather at 0000, 0300, 0600, 0900, 1200, 1500, 1800, and 2100 ZULU or UTC, whenever possible.⚓

National Weather Service Voluntary Observing Ship Program

New Recruits from 01-APR-97 to 30-JUN-97

NAME OF SHIP	CALL	AGENT NAME	RECRUITING PMO
BLOSSOM FOREVER	DZSL	KOYO LIN, LTD, HITOTSUBASHI CTR BLDG	SEATTLE, WA
BUNGA SAGA DUA	9MBL7	MALAYSIAN INTERNATIONAL SHIPPING CO.,LTD	SEATTLE, WA
CALIFORNIA JUPITER	ELKU8	NYK LINE N. A., INC	LOS ANGELES, CA
DAWN PRINCESS	ELTO4	PRINCESS CRUISES	MIAMI, FL
EDWARD L. RYERSON	WM5464	INLAND STEEL CO	CHICAGO, IL
EVER ULTRA	3FEJ6	EVERGREEN AMERICA CORP.	SEATTLE, WA
EVER UNITED	3FMQ6	EVERGREEN AMERICA CORP.	SEATTLE, WA
HUAL TRACER	C6MR7	AUTOLINERS INC %JERICO ATRIUM	NEW YORK CITY, NY
HUAL TROOPER	C6NA3	AUTOLINERS INC.	NEW YORK CITY, NY
HUMBOLT CURRENT	J8FI4	GULF & ATLANTIC MARITIME SERVICES	HOUSTON, TX
HYUNDAI DISCOVERY	3FFR6	HYUNDAI AMERICA SHIPPING AGENT, INC	SEATTLE, WA
JACKLYN M.	WCV7620	ANDRIE INC,	CLEVELAND, OH
JAMES N. SULLIVAN	ELPG8	CHEVRON SHIPPING CO.	BALTIMORE, MD
LOK PRAGATI	ATZS	THE SHIPPING CORP. OF INDIA, LTD	SEATTLE, WA
LUISE OLDENDORFF	3FOW4	TEH-HU ENTERPRISES LTD	SEATTLE, WA
MAERSK CALIFORNIA	WCX5083	MAERSK INC.	HOUSTON, TX
MAERSK TENNESSEE	WCX3486	HARRINGTON	MIAMI, FL
MAERSK TEXAS	WCX3249	MAERSK INC.	HOUSTON, TX
NEDLLOYD ABIDJAN	S6BP	VAN OMMEREN SHIPPING BV	LOS ANGELES, CA
NORDMORITZ	P3YR5	REEDEREI NORD KLAUS OLDENDORFF	SEATTLE, WA
OCEAN CLIPPER	3EXI7	DIAMOND OFFSHORE DRILLING,INC.	NEW ORLEANS, LA
PRINCES HIGHWAY	3ERU8	STEVENS SHIPPING & TERMINAL CO.	JACKSONVILLE, FL
PUSAN SENATOR	DQVG	REEDEREI F. LAEISZ G.M.B.H	SEATTLE, WA
RHEINTAL	DQRE	TEC MARINE	MIAMI, FL
RONALD H. BROWN	WTEC	NOAAS RONALD H. BROWN	NEW ORLEANS, LA
ROSSEL CURRENT	J8FI6	GULF & ATLANTIC MARITIME SERVICES, INC.	HOUSTON, TX
RUBIN LARK	DYUE	INCHCAPE SHIPPING AGENCIES INC	NEW YORK CITY, NY
SEA MAJESTY	DYAA	MMS CO., LTD, SURFEEL NAKAMEGURO BLDG.	SEATTLE, WA
SUSAN W. HANNAH	WAH9146	HANNAH MARINE CORP.	CHICAGO, IL
T/V STATE OF MAINE	NTNR	MAINE MARITIME ACADEMY	NORFOLK, VA
TANCRED	LALX4	WILHELMSEN LINES	JACKSONVILLE, FL
USNS COMFORT	NCOM	2ND OFFICER	BALTIMORE, MD
USNS YANO	NAQH	MSC/BAY SHIP MANAGEMENT INC	NORFOLK, VA
VICTORIA	LACJ2	TECMARINE	MIAMI, FL

NOAA and USCG: Joint Effort Produces the AMVER/SEAS IV Software

Jill Wagoner
SEAS Program Office
NOAA Office of Oceanic and Atmospheric Research

Under a cooperative program between the National Oceanic and Atmospheric Administration (NOAA), U.S. Coast Guard (USCG), and COMSAT Corporation, shipboard software has been developed combining NOAA's Shipboard Environmental data Acquisition System (SEAS) and USCG's Automated Mutual-assistance Vessel Rescue (AMVER) program. The AMVER/ SEAS IV software was developed to take advantage of INMARSAT C technology. INMARSAT satellites provide global coverage while the AMVER/SEAS IV software enables messages to be transmitted in a binary format at reduced transmission costs.

The SEAS program relies on Voluntary Observing Ships (VOS) to report weather at synoptic hours, 00Z, 06Z, 12Z, and 18Z. Non-synoptic reports are also encouraged. The reports are forwarded to the National Weather Service (NWS). Each report received increases the accuracy of the forecasts provided to mariners. In addition, a limited number of ships are asked to collect oceanographic data. For these ships a SEAS field representative installs the extra hardware required and trains the crew to collect and transmit observations.

AMVER reports allow the U.S. Coast Guard to track a vessel's position. In the event of an emergency this information is used to identify all available resources which may be focused on aiding a ship in distress. The AMVER program relies on volunteer ships to send four types of reports. Sail Plans are submitted before departure indicating the ship's intended track. Current Position Reports are requested at least once every 48 hours. Arrival Reports are submitted indicating

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AMVER/SEAS IV Software

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date, time, and port of arrival. Deviation Reports are submitted during the voyage if the ship changes from the original sail plan.

Benefits

Participation in each of these voluntary programs returns substantial benefits to the ships.

1) ***Transmission costs are free to the ship.***

NOAA and USCG are responsible for all AMVER and SEAS transmission costs incurred by the ships participating in this program, as long as the messages are sent to the address specified in the software user's guide.

2) ***AMVER Position Reports and NOAA weather reports are integrated.***

Each time the ship transmits a weather report to NOAA an AMVER position report is automatically created and forwarded to USCG. This eliminates the requirement to send any AMVER reports while at sea and enables all AMVER report submission to be accomplished while in port.

3) ***Ship's crew are trained in the use of INMARSAT C terminals.***

GMDSS compliance requirements will be in effect in 1999. At this time most ships over 300 gross tons will be equipped with INMARSAT C terminals. It is important that mates are comfortable with using these terminals. Participation in the AMVER/SEAS program insures the mates are experienced with INMARSAT C. In the event of an emergency, when every second counts, this experience will significantly improve reaction time.

Requirements

1) ***PC and INMARSAT C terminal must be on the bridge.***

In most cases, the AMVER/SEAS software resides on a computer other than the INMARSAT terminal. In order to transport the observations by diskette from the PC to the terminal for transmission, it is most convenient if the two computers are in close proximity.

2) ***The INMARSAT unit must have a floppy drive.***

In order to transmit observations, a diskette containing the AMVER and SEAS messages is carried from the PC and inserted into the INMARSAT unit. The INMARSAT terminal must, therefore, have a floppy drive to accept the diskette.

3) ***The INMARSAT unit must have binary message capability.***

In order to reduce transmission costs, observations are compressed into a binary format. The INMARSAT units, therefore, must have binary format capability.

Information

If you are interested in learning more about the AMVER/SEAS IV program or would like to request a copy of the software at no charge, you may contact Jill Wagoner at:

Telephone: (301) 713-2790 x.154
Fax: (301) 713-4499
E-mail: jwagoner@nos.noaa.gov
Address: NOAA/OAR/AOML
1315 East West Hwy.
Room 11153
Silver Spring, MD 20910
Attn: Jill Wagoner⚓

Correction

On page 30 of the Fall 1996/Winter 1997 issue of Mariners Weather Log, it was stated that the Dusseldorf Express is a cargo or container ship owned by a German company and registered out of Newark, New Jersey. The article should have stated that the ship is registered out of Singapore.

Chevron South America *received a 1996 VOS award from New Orleans PMO John Warrelmann. Pictured from left are Kurt Tollefson, East Coast Crude and Products, Padcagoula Team Leader, Chevron Shipping Company; Arild Fjedstad, 2nd Officer; and Captain Max-Jurgen Schley, Master of the* Chevron South America.

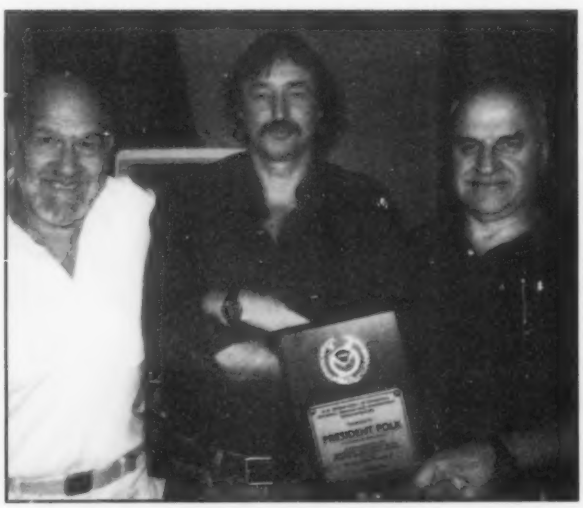
A 1996 VOS plaque was presented to Capt. Phillip J. Taylor, master of the Duncan Island *by Charles Henson, PMO Port Everglades, Florida.*

The NOAA ship Whiting *was presented a VOS award plaque. Standing left to right are Alvin Washington (Bosun Group Leader), Bernard Pooser (Seaman Surveyor), Cleo Louis (Seaman Surveyor), LTJG R.C. Jones, Tom Sherman (Seaman Surveyor), and Tim Rudy (Able Body Seaman).*

PMO George Smith of Cleveland (left) presents a VOS award to Capt. Al Tielke of the SS Kaye E. Barker.

George Smith, PMO Cleveland (right), presents a VOS award to Capt. Mitch Hallin of the M/V Paul R. Tregurtha.

Pictured from left to right are Ireneo Ballena (Radio Officer), Roden Apostol (2nd Officer), and Capt. Odon Blanco of the Mosel Ore *proudly displaying the VOS award presented to them by Pete Gibino, PMO Norfolk.*



The President Polk *comes through in 1996 with one of the top honors of the VOS program. Pictured from left to right, Radio Officer Jack Littman, Second Mate John Galvin, and Captain Bill Brocco.*

A 1996 VOS plaque was awarded to the Westwood Marianne *for the high quality of weather observations. Pictured with PMO Pat Brandow of Seattle from the left are Chief Mate Jovencio Mancol, Captain Ronelo Ledesma, and Radio Officer Joe Cuero Barros.*

The Sealand Voyager *was one of the ships recognized in 1996 by the VOS program for the high quality of weather observations. Pictured left to right are Chief Mate Mike Taylor, Seattle PMO Pat Brandow, Captain Mike Nelson, and Radio Officer Bob Hollins.*

A 1996 VOS plaque was awarded to the Westward Venture *for the high quality of surface observations. Pictured left to right are Captain Don Charland, PMO Pat Brandow of Seattle, and Chief Mate Louis Hartmann.*

The New Nikki *was one of the ships recognized in 1996 by the VOS program. Standing left to right are Radio Officer Jin-Liang Gu, Chief Mate Jian-Xin Huo, Seattle PMO Pat Brandow, and Captain Wan-Ming Liu.*

Water Spouts on Lake Michigan

The following six photos were taken from the *S/S Kaye E. Barker* off Alpena, Michigan, at approximately 0900 on September 12, 1996. The vessel was located just off the *Nordmeer* wreck site. (You can see the wreck marker in some of the photos.) You can see the progression of these water spouts in the photos and the crew estimated that they were about four miles from them and that the base of the largest one appeared to be nearly a mile across. Thanks to Capt. Al Tielke and Wheelsman Rick Boyle for the photos.

MAREPs in Alaskan Waters—You Can Help!

Stephan C. Kuhl
National Weather Service Office
Kodiak, Alaska

A meteorologist needs to have accurate weather observations in and around the area for which they are forecasting in order to prepare more accurate forecasts. For areas located on land, this is much less of a problem because of the large number of locations taking observations. On land, the National Weather Service can obtain meteorological data from airport observations, Automated Surface Observing Systems (ASOS), volunteer observers, radar, satellites, and weather balloons. However this is not the case over the ocean, and there are large areas that are void of any data at all. At sea, meteorological data is gathered from satellite, a few radars located near or along the Alaska coastline, a few buoys, and some volunteer observing ship reports.

Commercial fishermen, tug operators, recreational boaters, and other mariners can help fill this data void if they are willing to take volunteer Mariner Reports, or MAREPs, for the National Weather Service. MAREPs are weather observations that are taken at sea and transmitted to a National Weather Service office, or cooperating shore station, via High Frequency Upper Side Band (HF USB) or Very High Frequency (VHF) radio. After the observations are received, they are forwarded to marine forecasters who use them to make increasingly accurate forecasts. Most of the MAREPs in Kodiak are obtained by Peggy Dyson (WBH29) during her daily HF marine forecast broadcasts. Peggy has been collecting vital weather data and making HF marine broadcasts for the National Weather Service for many years and has received numerous awards for her efforts. In addition to Peggy Dyson, there are also several National Weather Service offices in Alaska that are standing by to collect MAREPs. These offices are illustrated in Table 1.

A MAREP consists of the following basic information:

- Who – Call sign or vessel name
- Where – Lat/Long or approximate location
- Wind speed and direction
- Sea height
- Present weather and visibility
- Barometric pressure

If you like, the following information may also be included:

- Air temperature
- Sea water temperature
- Swell height and direction
- Miscellaneous remarks

The standard times and how often you give these reports will depend

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MAREPs in Alaskan Waters

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on the National Weather Service office to which you are reporting. However, it is important to remember that any report is extremely useful to the marine forecaster. It is also important to remember that MAREPs should not take up a lot of your time. Since most vessels do not have a wind measuring instrument, such as an anemometer, wind speed is usually determined by noting the appearance of the sea and estimating the Beaufort Force. This method provides a true measure of wind speed. There is no need to factor out the speed of the vessel. Sea and swell heights are always estimated.

If you do decide to participate in the volunteer MAREP program, you will be providing the National Weather Service marine forecasters with vital meteorological data that can be obtained in no other way. For more information on the MAREP program and to obtain a copy of the "Guide To Sea State, Wind, and Clouds," which is an excellent guide to use in reporting Beaufort Force wind and seas, please contact your nearest National Weather Service office. The offices in Alaska are illustrated in Table 1.

Note: Kodiak MAREPs are taken by Peggy Dyson (WBH29) and at WSO Kodiak (KWL38). HF and VHF radios are monitored during the hours that the offices are open. VHF marine broadcasts are initially announced on channel 16 and most are then made on channel 9 one minute later as in the case of Annette. Barrow broadcasts on channel 66. Nome broadcasts on channel 9 and 10.⚓

Table 1. National Weather Service Alaska Region offices standing by to take MAREPs.

Station HF Call Sign	VHF Channel	HF USB Freq kHz	Phone Contact	Hours of Operation
Yakutat KGD91	16, 9	4125	(907) 784-3322	24 hours
Barrow KCB53	16, 66	4125	(907) 852-4445	24 hours
Annette KGD58	16, 9	4125	(907) 886-3241	12 am to 4 pm
Kodiak WBH29/KWL38	16, 9	4125	(907) 487-2102	24 hours
Cold Bay KCI95	16, 9	4125	(907) 532-2448	24 hours
King Salmon KCI98	16, 9	4125	(907) 246-3303	1 am to 5 pm
Nome KCI94	16, 9&10	4125	(907) 443-2321	24 hours

Familiarization Float Aboard the *SS Manukai*

Pat Brandow
Port Meteorological Officer
Seattle, Washington

The *SS Manukai* (KNLO) is owned by Matson Navigation Company of San Francisco. The container vessel's main route for the past few years has been on a triangle route from Seattle to San Francisco to Honolulu and returning to Seattle. One complete voyage takes about two weeks, depending upon the weather, especially during the winter months. The ship was built on the east coast in 1970 with 1,800 TEU container capacity. An original crew member who was on this trip indicated that in 1970 the *SS Manukai* was the largest container ship at the time. How things change—in 1996 we see ships getting bigger with total container capacity pushing over 6,000 TEU. The Chief Engineer, John Barker was an original "Plank Owner" of the *SS Manukai* and has been assigned to the vessel since 1970. He has spent over 13 years at sea with the ship during the past 26

Some of the crew members of the SS Manukai gather for a group photo.

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Fam Float Aboard the *SS Manukai*

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years. The trip that I was on marked the 662nd voyage of the *SS Manukai* on this route in the Pacific.

I arrived at Pier 25 in Seattle around 2000 PST Saturday 02 November to meet the ship. The Night Mate showed me to my quarters and informed me there was a slight change in the sailing time from Seattle. The ship was originally set to sail at 0300 PST Sunday, but due to some needed repairs on equipment in Oakland, the vessel departed exactly at midnight.

The Puget Sound Pilot boarded at 2330 PST for our five-hour journey through the waters of Puget Sound to Port Angeles. The ship traffic at that time of night was light which allowed the pilot to increase forward speed slightly, arriving at the Port Angeles station by 0400 PST. The Captain of the *SS Manukai*, Donald Marshall allowed me free access to the bridge during the pilotage through Puget Sound. This was a good experience for me to observe first-hand what goes on during the trip from Seattle to Port Angeles. I talked with the Pilot about how the weather affects his job within Puget Sound when taking ships to and from the pilot station. The Pilot indicated he monitors the VHF broadcast KHB-60 NOAA Weather Radio when on duty. The Pilot commented that they have to adapt to every weather situation when aboard vessels in Puget Sound.

The *SS Manukai* passed Cape Flattery at 0700 PST and turned south along the Washington coast en route to Oakland. The synoptic situation Sunday morning was typical for late fall with a weak 1008 MB low over central British Columbia with a front extending southwest through eastern Washington, Central Oregon, and Northern California. A weak secondary trough at the surface was situated around 300 miles behind the front along the coastal area of the Pacific Northwest. The weather once we rounded the corner at Cape Flattery was partly cloudy with a few rainshowers, winds northwest at 18 to 24 knots. The seas were 6 to 8 ft with the predominate swell from the northwest. The trip down the coast was smooth because high pressure was building in from the west over our route. The seas gradually decreased to 4 to 6 ft off of northern California by Monday morning.

During the past two years I have been helping Mark Bushnell of AOML in Miami, Florida deploy the National Weather Service barometer drifting buoys along the west coast of the United States. The main area of deployment covers the area bounded by 50 degs N to 30 degs N and 150 degs W to the U.S. west coast. I basically identify ships of opportunity who would like to participate in deploying the NWS barometer drifting buoys along their intended route. The buoys are stored at a Ships Chandlers warehouse and are delivered to the ship after the Captain of the vessel agrees to participate in the program. Instructions are given on how and at what latitude and longitude to deploy the buoys. So far the response for deploying the barometer buoys has been favorable from the different U.S. flag and foreign flag vessels. Most of the "Salty Masters" know from first-hand experience that it is better to "give than to receive," when it comes to the weather.

Captain Don Marshall of the *SS Manukai* agreed to take on six of the NWS barometer drifting buoys for deployment on the intended route. Northwest Ship Chandlers delivered the buoys to the ship Saturday morning. The deck crew hoisted the boxes aboard and stowed the boxes in one of the aft cargo holds. One box contains two barometer drifters, with a weight of 150 pounds. Without the help of the deck crew I would have to get the boxes aboard myself, so a bravo/zulu for the excellent crew. The ship was transiting approximately 40 to 50 miles off the coast when the first three buoys were deployed. The "Salty" Chief Mate Jerry Bert assisted me in deploying the first buoy at 1100 PST Sunday 03 November, at 47 degs N and 125 degs W, off the Washington coast. The second buoy was deployed at 1700 PST at 45 degs N and 125 degs W, off the north Oregon coast. The third

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Fam Float Aboard the *SS Manukai*

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buoy was deployed at 2300 PST at 42 degs N and 126 degs W, off the south Oregon coast.

The fourth drifter was deployed on the way to Honolulu at 30.5 degs N and 138.8 degs W. The remaining two buoys would be deployed by the crew of the *Manukai* on the leg from Honolulu to Seattle, when crossing 139 deg W and 133 deg W. The crew members on the ship asked numerous of questions about the operations of the barometer drifters and were very supportive of the program.

Seattle PMO Pat Brandow assists Capt. Donald Marshall and Chief Engineer John Barker in deploying a National Weather Service barometer drifting buoy.

The ship's radio room was located below the bridge and continues to maintain one Radio Officer. The ship's main form of communication is SITOR, which is a narrow band/high frequency form of communications. All of the AMVER and VOS observations are transmitted through this form of communications. The radio shack is maintained from 0800 to 1200, 1400 to 1600, and 1800 to 2000 when underway, and some observations taken by the Mates on the bridge are not transmitted due to the hours of operations. This will be overcome in the future when INMARSAT "C" equipment coupled with GMDSS will be installed on the bridge, around 1999. This will allow the Mates to transmit most of the weather observations back to NCEP.

The NAVTEX recorder which was located in the radio room provided all coastal forecasts from Seattle, Portland, and San Francisco. The forecasts were copied and taken to the bridge for the Captain and the Mates. The Radio Officer maintains the weather facsimile equipment in the radio room. The broadcast from NCEP was copied from the Coast Guard at Pt. Reyes with great success on most occasions. We experimented with most of the frequencies from Pt. Reyes, with lower frequencies coming in better during the night and higher frequencies during the day. The Radio Officer agreed to copy a few extra facsimile charts so I could use them for training the Mates on the bridge. The High Seas Forecast from the Marine Prediction Center was copied when the radio officer was open for business. The High Seas Forecast was very well received by the ship as a broad brush forecast and used in conjunction with NCEP surface analysis.

The Radio Officer liked to keep abreast of the latest changes to the facsimile schedules around the world. A couple of books that he purchased to keep current are the "Guide to Utility Stations" and "Guide to Facsimile Radio Stations" by Klingenfuss, 12th Edition.

The Mates on the bridge were very well versed on the weather facsimile charts from NCEP and taking surface weather observa-

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Fam Float Aboard the SS Manukai

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tions. I tried to split my time on the bridge so I could also spend time with each Mate on their watch. The normal watch routine was divided between the three mates with four-hour watches during the 24-hour period. Learning was a two way street during the FamFloat training on the bridge. Most of the training was conducted with "How to Use Radiofacsimile Charts" from NCEP, emphasizing interpretation of the different charts. I used Lee Chesneau's advanced manual of "Marine Radiofacsimile Product Description," which proved to be an excellent "nuts and bolts" description of the facsimile broadcast. It would be beneficial if this manual could be published for the entire marine community. There is no manual at present that actually explains each chart on NCEP's broadcast. I also brought along a few copies of the Mariners Weather Log, Winter 1995 issue. This issue had my one of favorite articles—"Mariners Guide to the 500 Millibar"—and an excellent bonus of "Heavy Weather Avoidance" in the same issue. These two articles give objective techniques that are quick and easy to understand and apply to the everyday interpretation of weather facsimile maps. One thumb rule we used right off was the 5640 meter wintertime contour on the 500 MB being an excellent indication of the southern extent of surface winds of force 7 westerlies or greater.

I installed the AMVER/SEAS 4.0 software on my laptop computer before I departed Seattle. The Captain, Mates, and Radio Officer were introduced to the combined program of AMVER and SEAS throughout the voyage. The ship could not send the messages in the compressed format of SEAS 4.0 because the vessel did not have an INMARSAT "C" transmitter. The Mates are only on the ship for a few months before they are transferred to another ship, which could have the capability of sending the SEAS 4.0 via INMARSAT "C."

A Cadet was aboard the ship from Kings Point Maritime Academy for a few months of training. I checked with the Captain to see if I could conduct training with the Cadet on surface weather observations and he gave the go-ahead. I introduced the Cadet to the VOS program, basic meteorology, shared information on surface weather observations, and interpretation of marine facsimile products. He realized how weather played a large part in the everyday operation of shipboard operations.

The vessel arrived in Oakland on Monday afternoon and departed for Honolulu on Tuesday afternoon. The synoptic situation upon departure from San Francisco indicated an "area of high pressure centered 600 miles west of San Francisco nearly stationary and weakening slightly over the next 24 hours." Sixty miles offshore, winds were northerly at 25 knots, with combined seas of 8 to 10 ft. By 2100 PST winds increased to 28 to 33 knots or a Force 7, with combined seas of 15 to 20 ft. The Captain secured both the port and starboard outside walkways until further notice. I was on the bridge until midnight watching the spray come over the bow and toward the bridge. The sea state analysis that was put out by NCEP only indicated maximum seas of 8 to 12 feet in the area 150 miles off the central California coast on the 5th of November. The Marine Offshore Forecast put out by San Francisco over NAVTEX only indicated seas 6 to 8 feet.

The best was yet to come when on Wednesday afternoon at 07/0000 UTC Surface Analysis, NCEP had a "developing low of 996 MB at 30 degs N and 160 degs W." The Chief Mate handed me the "High Seas Forecast" containing the same information and asked me to keep the Captain appraised of the situation. At that time on Wednesday afternoon we were 1400 nautical miles due east northeast of the low pressure area. It was interesting to notice how the ship's personnel were reacting to the developing low. The Chief Mate was planning his days ahead, along with the deck department, because a lot of work is completed during daylight hours checking temperatures of refrigerated containers above deck, along with normal deck maintenance. If the seas are too high, any outside work above the main deck is prohibited.

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Fam Float Aboard the *SS Manukai*

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The ships forward speed averaged 22.5 knots on a course of 240 degrees. By Thursday afternoon at 08/0000 UTC Surface Analysis, NCEP had the situation as a "rapidly intensifying low" at 38 degs N and 150 degs W, with a center pressure of 986 mb. At that time, we were 800 miles away from the prefrontal trough out ahead of the trailing cold front, associated with the deep low pressure area. The observation at the ship Thursday afternoon indicated southeast winds of 20 knots, with combined seas of 8 to 12 feet. The pressure at the surface was still quite high at around 1020 mb, due to the high pressure area off the west coast of the United States. The barograph trace indicated a downward movement of the pressure. After midnight the seas gradually increased to combined 12 to 18 ft, with the pressure decreasing to 1008 mb by 08/1200 UTC.

By the 08/1800 UTC Surface Analysis, Friday morning, the low was "storm" at 41 degs N and 152 degs W, with central pressure of 976 mb. The low already started to occlude at the surface, and the ship was 200 miles due east of the new position of the cold front. The pressure gradient increased surface winds to 34 to 40 knots with squalls to 60 knots in very heavy rain. A Beaford scale of Force 8, with 18 to 25 ft seas applied to this present situation. Blowing spray occurred frequently over the bow and to the bridge deck. We were "rocking and rolling" for the next few hours as we penetrated the area of the cold front. The lowest pressure recorded from the ship was 1005 mb at 08/1800 UTC. The ship slowed somewhat, due to the high seas, to around 18 to 20 knots when we passed through the front.

The remaining time en route to Honolulu was uneventful, except for a very long northerly swell on the back side of the cold frontal system. The range of the swell was 12 to 18 feet with a 10 to 15 seconds period. The long swell allowed for some nice sleeping conditions, as it rocked you to sleep. The High Seas Forecast and all of NCEP Facsimile charts depicted the developing low en route to Honolulu very well. Vessels at sea depend on this broadcast for keeping the ship and cargo aboard safe.

The voyage aboard the *SS Manukai* provided me with the opportunity to gain insight into the normal operations of a typical container vessel. I am very appreciative of the hospitality of the Captain and the crew of the ship.⚓

Chief Mate Jerry Bert with one of the National Weather Service barometer drifting buoys.

Contrary to Popular Belief, Lightening Does Strike Twice... And So Do Hurricanes!

CDR Maureen R. Kenny, NOAA
Commanding Officer
NOAA Ship Whiting

"Who would've thought it?" That was what the crew kept saying on the NOAA Ship *Whiting* as hurricane Fran bore down on Wilmington, North Carolina. *Whiting* was bracing for the "pleasure" of viewing yet another hurricane up close and personal, having already endured the eye of hurricane Bertha.

Whiting, a 163-foot survey vessel, is presently surveying the approaches to the Cape Fear River, Wilmington, North Carolina. The surveys will be used to update the nautical charts in the area and are being performed at the request of the U.S. Coast Guard, North Carolina State Ports Authority, and the Cape Fear Pilots Association. Normally, the summer months are an excellent time for survey operations with waves of 5 feet or less the majority of the time. But on July 12, the seas were building as hurricane Bertha struck the North Carolina coast near the Cape Fear River.

Preparations

Hurricanes present special challenges for the mariner, especially smaller vessels which cannot weather a storm at sea or evade the storm by outrunning it. Good seamanship is therefore extremely important and all storms must be closely watched. We began tracking Bertha as soon as she was declared a tropical storm to determine well in advance if it would be necessary for the ship to move to protected waters or to a different port for safety reasons.

As Bertha approached, the weather forecasters (NOAA, local TV, and Navy) were predicting that the slow-moving low, which was hovering over the North Carolina-Virginia coasts, would steer Bertha to the northeast and offshore. On Wednesday July 10, as the low disintegrated, Bertha began tracking towards the North and South Carolina coasts and the forecasters started sounding less sure about the expected path.

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The NOAA Ship Whiting

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Whiting headed up the Cape Fear River that afternoon and tied up at the North Carolina State Port Authority pier, a very substantial pier about 20 miles up the river with an excellent fender system. This location had been prearranged as our hurricane berth earlier in the season. Preparations for the storm began upon arrival and continued until midnight on Wednesday and on Thursday from 0800 until 1700. Some of the preparations included securing everything on deck, clearing the launches of equipment on the open decks, attaching all the porthole covers, covering all but two of the bridge windows with plywood, laying out lifelines leading to all lines and the anchors, placing 14 lines to the pier along with two 7/8" cables, and preparing a hurricane watch bill. Our flying bridge looked like a wood shop with saws ripping through all our shoring material!

Bertha Arrives

We expected gale force winds to start on Thursday night at 2000 with hurricane winds arriving in the early morning. But Bertha had a mind of her own and took her time arriving. The high winds actually started on Friday morning, July 12, with hurricane force winds reaching us at 1330. We put the engines on line at 1200 and set up an interior route to the bridge through an escape hatch (*Whiting*'s only inside route to the bridge). From about 1330 until 1600, we were feeling the effects of the front wall of the storm and had sustained winds of 50 to 70 mph with gusts to just under 100 mph. We only saw a couple gusts over 100. And yes, the wind does sound like a freight train at times. The west side of the eye passed over us about 1630 and the back side of the storm was relatively tame with gusts to 70 mph. Engines were taken offline at 2030.

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Contrary to Popular Belief ...

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Our major concern was the storm surge of 8-10 feet that was predicted. However, with the strongest winds of the front right and then left quarters of the storm coming from the northeast as Bertha wobbled towards Wilmington, it appeared to blow the water down the river and no surge was seen at all.

The damage to *Whiting* from Bertha was minimal. The most significant damage was to our radar when a halyard on the forward mast snapped and wrapped itself around the turning unit. The only other damage found was an antenna that came down due to a broken metal bracket, an electronic wire snapped on the aftermast, and half of our navigation lights burnt out probably due to the heavy vibration in the aftermast from the wind.

Post-Hurricane Work

Whiting assisted the U.S. Coast Guard and U.S. Army Corps of Engineers in surveying the Cape Fear River after the hurricane. The surveys were used to verify that the shipping channel was intact and to allow the port to be re-opened as soon as possible. The Cape Fear River was subsequently opened Sunday evening for large vessel traffic.

Hurricane Fran

What are the chances of being overrun by two hurricanes in one year? I now answer that question differently given this hurricane season. *Whiting* was forced once again to run for cover as Fran approached the East Coast. We arrived at the North Carolina State Port Authority pier at 1930 on Wednesday, September 4, and closely monitored the local news and NOAA weather for updates on Fran's projected landfall.

As we listened to the reports throughout Wednesday and on into Thursday, we hoped that the forecasters were correct and Fran would strike Savannah or Charleston (my apologies to those cities!). Unfortunately, forecasters slowly moved the projected landfall up the coast from Savannah to the Cape Fear region. Beginning on Thursday morning, *Whiting* once again had to prepare for hurricane force winds. This time, having been through it previously, the *Whiting* was ready for Fran within 5 hours.

We began to feel Fran's initial effects during the early afternoon hours of September 5. Hurricane force winds began around 1830. Over the next 3 hours the ship was buffeted by 70-90 mph winds with a maximum gust of 110 mph as the front wall of the hurricane came straight for downtown Wilmington. The barometer bottomed out at 960mb at 2130 when the eye of the hurricane passed over the ship. The actual center of the eye passed approximately 7 miles to the west of our mooring.

With Fran, it appeared we experienced a 5-6 foot storm surge; fortunately, it hit at low tide. During our encounter with the backside of Fran, we saw consistent 60-70 mph winds with gusts to 92 mph. At 0630, after the winds had died down to under 50 mph, the main engines were secured and the hurricane watch stood down. Damage to *Whiting* was less during this hurricane with only our radar suffering some water damage. *Whiting* again assisted in the re-opening of the Cape Fear River to commercial traffic by performing surveys in the main channel.

We were extremely lucky that the pier with our tide gauge (used to determine tide correctors for our survey work) remained standing and almost damage-free through both storms. The data buoy in our work area had been reporting 24-foot seas for Bertha and 30-foot seas for Fran. Two large piers just to the west lost 100 feet of pier length each. Some piers to the east were totally demolished. The leveling teams found the tide gauge pier had no significant change in elevation after each hurricane rolled through.

Shall we go for three? Been there, done that, don't care to do it again!⚓

Gardens Within the Ocean: A Survey of Seaweed

Ramona Schreiber
National Marine Fisheries Service

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Seaweeds have been called by many other terms—kelp, scum, and sea wrack, just to name a few. All of these terms are used to describe the growth on rocks, piles, boat hulls, materials found on the beach that's been washed ashore with the tide, or fouled around a propeller. This article takes a closer look at the typical marine plants associated with these descriptors.

Seaweeds are generally considered marine plants (although some believe their classification is more appropriate within the protista). They represent an extremely varied collection, from microscopic diatoms to 50-meter-long strands of macroflora. They differ from terrestrial plants and seagrasses, as seaweeds do not produce seeds, flowers, fruits, roots, or stems. Macroscopic plants do, however, possess similar structures to their terrestrial counterparts. The equivalent to the stem is the *stalk* or *stipe*; the attachment structures that function in a manner similar to roots are the *holdfasts*; leaf-like structures are *blades* or *fronds*; and the complete plant is the *thallus*. Without seeds and flowers, reproduction in some seaweeds occurs via the production of spores. The majority of the seaweeds reproduce by fragmentation.

These plants can be classified into four groups, and each group contains characteristic and distinctive pigments. Variations in pigment represent an adaptation to the requirements of the zone where the plant occurs. These groups include blue-green algae, green algae, brown algae, and red algae. Chlorophyll is the primary pigment in terrestrial plants. These plants use chlorophyll to transform light energy into food within the plant. In the marine environment, however, other pigments are better suited to different levels of light availability. Thus, marine plants such as the seaweed have adapted to utilize these other pigments depending on the environment within the life zone.

Blue-green algae. This category includes the Division *Cyanophyta*. There is evidence that this group dates back more than 2 billion years in the fossil record. Some consider this division to be bacteria because there is no nuclear membrane within their cells (this is a characteristic of bacteria). However, the blue-green algae contain chlorophyll and this pigment is used for photosynthesis. These plants have a blue-green tint, and are primarily small. They may be dark mats attached to rocks, filamentous, fine threads, or clusters of spongy tufts. The algae's gelatinous sheath provides protection from dehydration during low tide.

Green Algae. The most conspicuous algae in fresh water are the

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Gardens Within the Ocean

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greens, Division *Chlorophyta.* Also containing chlorophyll, this green pigment within the cells predominates over other pigments. In the marine environment, greens are far less common, existing primarily in tropical and subtropical regions. Many benthic green algae are macroscopic in size, and can grow to several feet in length. Near the shore, they are easily recognized by their grassy green color. Green seaweeds exist in a range of shapes, from filaments and sheets to cylinders and spheres. They require considerable light and are most common in the high intertidal zones or subtidally in shallow water. *Ulva lactuca,* sea lettuce, grows near and below the low tide mark across the Atlantic coast. As the name implies, sea lettuce is eaten by many fish and invertebrates, as well as humans. It can be added to salads or dried and powdered for use as a seasoning. In warm clear seas, many greens are calcareous, including *Halimeda.* These algae contribute to the coralline formation of reefs.

Brown algae. This Division, *Phaeophyta,* contains chlorophyll, however, the green color is masked by accessory yellow-brown pigments. Accessory pigments gather light as part of the photosynthesis process, and give the algae their characteristic golden to olive-brown color. The brown algae include the largest and most conspicuous group of seaweed. Giant kelp grow in the cool waters of the southern hemisphere. Off the coast of California these large plants, *Macrocyctis pyrifera* exist in forest-like stands and can grow 100 meters in length. On the eastern coast of the United States, browns do not grow to the extensive heights, however they are the largest and most abundant of the seaweeds in rocky coastal areas. *Fucus,* or sea wrack, carpets intertidal rocks. Other browns live below the tide line, sometimes reaching two meters in length. In tropical waters, the largest brown algae tend to be a variation of *sargassum.* While most exist attached to a substrate, a few species of sargassum float in the gulf stream as large rafts. These mats provide valuable habitat for a diversity of fish and invertebrates.

Red algae. There are more species of this Division, *Rhodophyta,* than of the brown and green seaweeds combined. Despite their great diversity, this group is much less conspicuous and are primarily marine. Red algae contain chlorophyll and two accessory pigments, one bright red and one bluish-red. Using these accessory pigments, reds are able to grow in low light conditions. Some species may be found at depths greater than 200 meters. They often take beautiful forms, as epiphytes on other algae, or large fleshy plants attached to rocks. Reds predominate in tropical and subtropical regions, often binding material together in coralline masses. Their red color is not uniform, but may range from yellow to purple-pink. Purple laver, also called nori, is the familiar red algae *Porphyra,* often used as a food source. Other reds include dulse, *Palmeria palmata,* and Irish moss, *Chondrus crispus.*

Seaweed has been used over the centuries for a number of purposes, including fertilizer, fodder, and food. In Ireland, it was used as fertilizer where soils were absent or poor quality to provide a rich source of nutrients. Over the years, farm animals have been fed a diet containing a mix of seaweed in some coastal regions. A multitude of household products include by-products of seaweeds. Paint, hand cream, and toothpaste are just a few examples. Carrageenan is a by-product of Irish moss used as a thickening agent in food and industry. *Macrocyctis* is one of several kelps that are used for animal food, fertilizers, and algin acid. Nori is a staple of many diets. It can be eaten straight from the rocks, dried, salted, boiled in soups, wrapped in rice cakes, in salads, or ground as seasoning. Dulse and Irish moss are so highly prized that they are commercially gathered and sold as vegetables and used in dessert.

To the biologist, the diversity of forms and life history of the seaweeds are the basis of wide study. Seaweeds are a critical food source for a multitude of organisms (including humans), they provide elemental energy through photosynthesis as well as decomposition, and they provide habitat for fish and invertebrates. Their unusual life histories continue to be examined. Without these diverse algae, our ocean waters would be a barren and considerably different environment.⚓

VOS Cooperative Ship Reports — 4th Quarter 1996 and 1st Quarter 1997

The National Climatic Data Center compiles the tables for the VOS Cooperative Ship Report from radio messages and weather logs. The three columns under the heading "MANUSCRIPT RECEIVED" denote whether or not a form was received for that month (Y/N). Forms are considered late (L) if they arrive more than 60 days after the data month. Some ships may show 100% radio observations but show forms were also received. This occurs when the mail and radio observations are duplicated. The observation count does not reflect duplicates.

Port Meteorological Officers supply ship names to the NCDC. Comments or questions regarding this report should be directed to NCDC, Operations Support Division, 151 Patton Avenue, Asheville, NC 28801 Attn: Dimitri Chappas (704-271-4437 or dchappas@ncdc.noaa.gov).

NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED OCT	NOV	DEC
1ST LT ALEX BONNYMAN	12	50.0	Y	N	N
1ST LT BALDOMERO LOPEZ	71	100.0	Y	Y	Y
1ST LT JACK LUMMUS	68	100.0	N	N	N
2ND LT. JOHN P. BOBO	39	74.3	Y	N	N
A. V. KASTNER	111	100.0	N	N	N
AALSMEERGRACHT	173	100.0	N	N	N
ACACIA	23	100.0	N	N	N
ACADIA FOREST	171	35.6	Y	Y	Y
ACT 7	190	100.0	N	N	N
ACT I	99	100.0	N	N	N
ADAM E. CORNELIUS	64	100.0	N	N	N
ADDIRIYAH	66	96.9	Y	N	N
ADVANTAGE	39	84.6	Y	Y	Y
AGULHAS	93	67.7	Y	Y	Y
AL AWDAH	94	100.0	N	N	N
AL SAMIDOON	194	100.0	N	N	N
AL SHUHADAA	201	100.0	N	N	N
AL WATTAYAH	117	25.6	Y	Y	Y
ALBEMARLE ISLAND	43	100.0	N	N	N
ALBERNI DAWN	59	100.0	N	N	N
ALDEN W. CLAUSEN	45	100.0	N	N	N
ALLIGATIOR WISDOM	1	100.0	N	N	N
ALLIGATOR AMERICA	134	100.0	N	N	N
ALLIGATOR BRAVERY	150	93.3	Y	Y	Y
ALLIGATOR COLUMBUS	154	52.5	Y	Y	Y
ALLIGATOR GLORY	66	74.2	Y	Y	Y
ALLIGATOR LIBERTY	152	100.0	N	N	N
ALLIGATOR STRENGTH	170	48.2	Y	Y	Y
ALLIGATOR VICTORY	33	96.9	Y	Y	Y
ALMANIA	18	88.8	Y	N	N
ALMERIA LYKES	165	100.0	N	N	N
AMALIA	10	100.0	N	N	N
AMAZON	66	100.0	N	N	N
AMBASSADOR	44	75.0	Y	Y	Y
AMBASSADOR BRIDGE	104	85.5	Y	Y	Y
AMERICA STAR	150	100.0	N	N	N
AMERICAN CONDOR	203	0.0	Y	Y	Y
AMERICAN CORMORANT	15	100.0	N	N	N
AMERICAN FALCON	93	78.4	Y	Y	Y
AMERICAN OSPREY	19	100.0	N	N	N
AMERICAN REPUBLIC	1	100.0	N	N	N
AMERICANA	36	86.1	Y	Y	Y
AMERIGO VESPUCCI	12	100.0	N	N	N
ANASTASIS	43	100.0	N	N	N
ANATOLIY KOLESNICHENKO	21	100.0	N	N	N
ANDERS MAERSK	205	46.8	Y	Y	Y
ANGELA	54	100.0	N	N	N
ANGLIAN REEFER	62	100.0	N	N	N
ANNA MAERSK	197	67.5	Y	Y	Y
AOMORI WILLOW	129	100.0	N	N	N
APL CHINA	156	84.6	Y	Y	N
APL JAPAN	121	82.6	Y	Y	Y
APL KOREA	59	100.0	N	N	N
APL PHILIPPINES	170	80.0	Y	Y	Y
APL SINGAPORE	114	78.9	Y	Y	N
APL THAILAND	229	11.3	Y	Y	Y
ARABELLA	5	100.0	N	N	N
ARABIAN SEA	86	79.0	Y	Y	Y
ARABIAN SENATOR	32	100.0	N	N	N
ARCO ALASKA	23	30.4	Y	N	N
ARCO CALIFORNIA	52	88.4	Y	Y	Y
ARCO FAIRBANKS	40	95.0	Y	Y	N
ARCO INDEPENDENCE	61	32.7	Y	Y	Y
ARCO SAG RIVER	1	100.0	N	N	N
ARCO SPIRIT	49	95.9	Y	Y	Y
ARCTIC OCEAN	149	69.7	Y	Y	Y
ARCTIC SUN	152	57.2	Y	Y	Y
ARCTIC UNIVERSAL	172	100.0	N	N	N
ARGONAUT	87	42.5	Y	Y	Y
ARIES	21	100.0	N	N	N
ARKTIS LIGHT	248	82.2	Y	Y	N
ARMCO	147	76.8	Y	Y	Y
ARTHUR M. ANDERSON	214	79.4	Y	Y	Y
ARTHUR MAERSK	238	77.7	Y	Y	Y
ASPHALT COMMANDER	30	100.0	N	N	N
ATLANTA BAY	23	100.0	N	N	N
ATLANTIC	632	100.0	N	N	N
ATLANTIC BULKER	116	100.0	N	N	N
ATLANTIC COMPANION	65	100.0	N	N	N
ATLANTIC COMPASS	94	100.0	N	N	N

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED OCT	NOV	DEC
ATLANTIC CONCERT	52	100.0	N	N	N
ATLANTIC CONVEYOR	28	100.0	N	N	N
ATLANTIC HURON	193	100.0	N	N	N
ATLANTIC SUPERIOR	27	100.0	N	N	N
AUCKLAND STAR	110	100.0	N	N	N
AUSTRAL RAINBOW	4	100.0	N	N	N
AUTHOR	78	100.0	N	N	N
AXEL MAERSK	139	74.8	Y	Y	Y
B.T. ALASKA	126	29.3	Y	Y	Y
BANDA SEAHORSE	119	100.0	N	N	N
BARBARA ANDRIE	41	100.0	N	N	N
BARRINGTON ISLAND	153	100.0	N	N	N
BAUCHI	1	100.0	N	N	N
BAY BRIDGE	130	6.1	Y	Y	Y
BELGRANO	124	52.4	Y	N	N
BERING SEA	177	76.8	Y	Y	Y
BERNARDO QUINTANA A	207	86.4	Y	Y	Y
BLEST FUTURE	60	78.3	Y	N	N
BLUE GEMINI	50	100.0	N	N	N
BOHINJ	386	0.7	Y	Y	Y
BONN EXPRESS	973	100.0	N	N	N
BOSPORUS BRIDGE	256	57.0	Y	Y	Y
BP ADMIRAL	1	100.0	N	N	N
BREMEN EXPRESS	86	100.0	N	N	N
BRIGHT PHOENIX	227	94.2	Y	Y	Y
BRISBANE STAR	193	100.0	N	N	N
BRITISH ADVENTURE	123	100.0	N	N	N
BRITISH RANGER	223	100.0	N	N	N
BROOKLYN BRIDGE	195	98.4	Y	Y	Y
BRUCE SMART	113	100.0	N	N	N
BT NIMROD	147	100.0	N	N	N
BUCKEYE	283	53.3	Y	Y	Y
BUNGA ORKID DUA	44	100.0	N	N	N
BUNGA SAGA TIGA	144	91.6	Y	Y	Y
BURNS HARBOR	421	100.0	N	N	N
CALCITE II	66	100.0	N	N	N
CALIFORNIA CURRENT	235	100.0	N	N	N
CALIFORNIA HIGHWAY	4	100.0	N	N	N
CALIFORNIA LUNA	32	100.0	N	N	N
CALIFORNIA MERCURY	61	100.0	N	N	N
CALIFORNIA PEGASUS	66	100.0	N	N	N
CALIFORNIA SATURN	26	100.0	N	N	N
CALIFORNIA TRITON	142	68.3	Y	Y	Y
CALIFORNIA ZEUS	48	100.0	Y	Y	Y
CAPE BREEZE	98	96.9	Y	Y	N
CAPE CHARLES	61	100.0	N	N	N
CAPE HENRY	50	96.0	Y	Y	Y
CAPE MAY	119	100.0	N	N	N
CAPE WASHINGTON	27	100.0	Y	N	N
CAPE WRATH	115	100.0	Y	Y	Y
CAPTAIN LEE	19	100.0	N	N	N
CARDIGAN BAY	172	100.0	N	N	N
CARLA A. HILLS	161	100.0	N	N	N
CAROLINE OLDENDORFF	97	100.0	N	N	N
CASON J. CALLAWAY	215	100.0	N	N	N
CELEBRATION	30	100.0	N	N	N
CELTIC SEA	6	100.0	N	N	N
CENTURY HIGHWAY #2	65	100.0	N	N	N
CENTURY HIGHWAY NO. 1	44	100.0	N	N	N
CENTURY HIGHWAY_NO. 3	6	100.0	N	N	N
CENTURY LEADER NO. 1	115	100.0	N	N	N
CGM PROVENCE	67	100.0	N	N	N
CHARLES B. RENFREW	14	100.0	N	N	N
CHARLES E. WILSON	3	100.0	N	N	N
CHARLES ISLAND	50	100.0	N	N	N
CHARLES LYKES	116	100.0	N	N	N
CHARLES M. BEEGHLEY	35	77.1	Y	Y	Y
CHARLES PIGOTT	44	100.0	N	N	N
CHARLESTON	5	100.0	N	N	N
CHARLOTTE MAERSK	20	0.0	Y	N	N
CHASTINE MAERSK	164	100.0	N	N	N
CHC NO.1	9	100.0	N	N	N
CHEMBULK FORTITUDE	18	100.0	N	N	N
CHEMICAL PIONEER	75	86.6	Y	Y	N
CHEMICAL RUBI	2	100.0	N	N	N
CHESAPEAKE TRADER	134	100.0	N	N	N
CHEVRON ARIZONA	59	100.0	N	N	N
CHEVRON ATLANTIC	56	100.0	N	N	N
CHEVRON COLORADO	124	75.8	Y	Y	Y
CHEVRON EDINBURGH	216	64.8	Y	Y	Y
CHEVRON EMPLOYEE PRIDE	154	0.6	Y	Y	Y
CHEVRON FELUY	328	0.0	Y	N	N
CHEVRON MISSISSIPPI	205	100.0	N	N	N
CHEVRON OREGON	13	7.6	Y	Y	N
CHEVRON PERTH	142	100.0	N	N	N
CHEVRON SOUTH AMERICA	174	82.1	Y	Y	Y
CHIEF GADAO	92	67.3	Y	Y	Y
CHILEAN EXPRESS	4	100.0	N	N	N
CHINA HOPE	40	100.0	N	N	N
CHIQUITA BARACOA	97	100.0	N	N	N
CHIQUITA BARU	53	100.0	N	N	N
CHIQUITA BELGIE	115	100.0	N	N	N
CHIQUITA BREMEN	41	100.0	N	N	N
CHIQUITA BRENDA	146	100.0	N	N	N
CHIQUITA DEUTSCHLAND	144	100.0	N	N	N
CHIQUITA ELKESCHLAND	6	100.0	N	N	N
CHIQUITA FRANCES	252	100.0	N	N	N
CHIQUITA ITALIA	162	100.0	N	N	N
CHIQUITA JEAN	148	100.0	N	N	N
CHIQUITA JOY	142	100.0	N	N	N
CHIQUITA NEDERLAND	95	100.0	N	N	N
CHIQUITA SCANDINAVIA	107	100.0	N	N	N
CHIQUITA SCHWEIZ	148	100.0	N	N	N
CHOAPA	1	100.0	N	N	N
CHOYANG PRIDE	127	100.0	N	N	N
CHOYANG VISION	56	44.6	Y	N	N
CHRISTIANE	75	100.0	N	N	N
CHUN HO	194	51.0	Y	Y	Y
CITY OF DURBAN	200	100.0	N	N	N
CLEVELAND	45	24.4	Y	N	N
CLIFFORD MAERSK	43	100.0	N	N	N
CMS ISLAND EXPRESS	6	100.0	N	N	N
COAST RANGE	56	100.0	N	N	N
COLUMBIA BAY	113	100.0	N	N	N
COLUMBIA STAR	349	100.0	N	N	N
COLUMBINE	209	100.0	Y	N	N
COLUMBUS AMERICA	325	100.0	N	N	N
COLUMBUS CALIFORNIA	113	100.0	N	N	N
COLUMBUS CANADA	223	100.0	N	N	N
COLUMBUS QUEENSLAND	113	100.0	N	N	N
COLUMBUS VICTORIA	265	100.0	N	N	N
CONDOLEEZZA RICE	77	0.0	Y	N	N
CONTIENTAL WING	111	100.0	N	N	N
CONTSHIP AMERICA	40	100.0	N	N	N
CONTSHIP FRANCE	3	100.0	N	N	N
CONTSHIP HOUSTON	34	100.0	N	N	N
COPACABANA	45	100.0	N	N	N
CORAL HIGHWAY	145	100.0	N	N	N

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED OCT	NOV	DEC
CORDELIA	18	100.0	N	N	N
CORMORANT ARROW	33	100.0	N	N	N
CORNELIA MAERSK	98	79.5	Y	N	N
CORNUCOPIA	117	88.8	Y	Y	Y
CORONADO	4	100.0	N	N	N
CORPUS CHRISTI	17	100.0	N	N	N
CORWITH CRAMER	45	100.0	N	N	N
COSMIC CHALLENGER	42	100.0	N	N	N
COSMIC MASTER	83	95.1	Y	Y	N
COSMOWAY	41	68.2	Y	Y	N
COURAGEOUS	14	0.0	Y	N	N
COURIER	84	100.0	N	N	N
COURTNEY BURTON	197	69.5	Y	Y	Y
COURTNEY L	23	100.0	N	N	N
CRISTINA 1	55	100.0	N	N	N
CRISTOFORO COLOMBO	68	100.0	N	N	N
CROATIA EXPRESS	4	100.0	N	N	N
CROWN OF SCANDINAVIA	233	100.0	N	N	N
CSK UNITY	60	100.0	N	N	N
CSL ATLAS	40	100.0	N	N	N
CSL CABO	112	83.9	Y	Y	Y
CSS HUDSON	163	100.0	N	N	N
DAGMAR MAERSK	47	100.0	N	N	N
DAISHIN MARU	85	100.0	N	N	N
DAVID Z. NORTON	42	85.7	Y	Y	N
DEL MONTE CONSUMER	99	1.0	Y	Y	N
DEL MONTE PACKER	46	100.0	N	N	N
DEL MONTE TRADER	163	61.9	Y	Y	Y
DELAWARE TRADER	386	75.1	Y	N	N
DELMONTE PLANTER	51	0.0	Y	Y	Y
DELMONTE TRANSPORTER	8	100.0	N	N	N
DENALI	173	91.9	Y	Y	Y
DEPPE FLORIDA	42	100.0	N	N	N
DESTINY	105	100.0	N	N	N
DG COLUMBIA	202	84.1	Y	Y	Y
DIAMOND STAR	65	100.0	N	N	N
DIRCH MAERSK	76	3.9	Y	Y	Y
DIRECT EAGLE	387	31.5	Y	Y	Y
DIRECT FALCON	153	100.0	N	N	N
DIRECT KEA	181	100.0	N	N	N
DIRECT KIWI	172	100.0	N	N	N
DIRECT KOOKABURRA	197	100.0	N	N	N
DOCK EXPRESS 10	40	100.0	N	N	N
DOCK EXPRESS 20	108	100.0	N	N	N
DOCTOR LYKES	120	58.3	Y	Y	Y
DOLE COSTA RICA	19	100.0	N	N	N
DORTHE OLDENDORFF	136	65.4	Y	Y	Y
DOUBLE GLORY	41	51.2	Y	Y	N
DRYSO	69	100.0	N	N	N
DSR BALTIC	63	100.0	N	N	N
DSR EUROPE	162	100.0	N	N	N
DSR PACIFIC	108	100.0	N	N	N
DUBROVNIK EXPRESS	55	100.0	N	N	N
DUCHESS	25	100.0	N	N	N
DUHALLOW	220	100.0	N	N	N
DUNCAN ISLAND	224	87.5	Y	Y	Y
DUSSELDORF EXPRESS	786	100.0	N	N	N
E.P. LE QUEBECOIS	356	100.0	N	N	N
EAGLE ANAHUAC	72	100.0	N	N	N
EARL W. OGLEBAY	13	76.9	Y	N	N
EASTERN LION	113	100.0	N	N	N
ECSTASY	104	0.0	Y	N	N
EDELWIESS	109	93.5	Y	N	N
EDGAR B. SPEER	190	81.0	Y	Y	Y
EDWIN H. GOTT	339	100.0	N	N	N
EDWIN LINK	103	0.0	Y	N	N
EDYTH L	146	86.9	Y	Y	Y
ELENORE	30	100.0	N	N	N
ELISE SHULTE	76	100.0	N	N	N
ELLEN KNUDSEN	5	100.0	N	N	N
ELLENSBORG	112	0.0	Y	Y	Y
ELLIOTT BAY	187	73.2	Y	Y	Y
ELSBERG	54	0.0	Y	Y	Y
ENERGY ENTERPRISE	12	100.0	N	N	N
ENGLISH STAR	171	100.0	N	N	N
ENIF	155	100.0	N	N	N
EVER GAINING	36	100.0	N	N	N
EVER GALLANT	5	100.0	N	N	N
EVER GARLAND	9	100.0	N	N	N
EVER GENIUS	1	100.0	N	N	N
EVER GIVEN	46	100.0	N	N	N
EVER GLEAMY	10	100.0	Y	Y	N
EVER GLOBE	4	100.0	N	N	N
EVER GOLDEN	26	100.0	N	N	N
EVER GOVERN	13	100.0	N	N	N
EVER GRADE	8	100.0	N	N	N
EVER GUARD	14	100.0	N	N	N
EVER LAUREL	7	100.0	N	N	N
EVER RACER	21	100.0	N	N	N
EVER REACH	13	100.0	N	N	N
EVER REPUTE	22	86.3	Y	N	N
EVER RESULT	70	77.1	Y	N	N
EVER REWARD	12	100.0	N	N	N
EVER RIGHT	4	100.0	N	N	N
EVER ROUND	11	100.0	N	N	N
EWL VENEZUELA	720	100.0	N	N	N
EXCELSIOR	216	100.0	N	N	N
EXEMPLAR	203	100.0	N	N	N
EXPORT FREEDOM	109	46.7	Y	Y	Y
EXPORT PATRIOT	153	41.8	Y	Y	Y
FAIRLIFT	104	100.0	N	N	N
FALSTRIA	115	100.0	N	N	N
FANTASY	4	100.0	N	N	N
FARALLON ISLAND	368	100.0	N	N	N
FASCINATION	38	57.8	Y	N	N
FAUST	153	53.5	Y	Y	Y
FERNCROFT	12	100.0	N	N	N
FETISH	1	100.0	N	N	N
FIDELIO	96	100.0	Y	Y	Y
FIGARO	16	100.0	N	N	N
FIR GROVE	46	100.0	N	N	N
FLAMENGO	105	100.0	N	N	N
FOREST CHAMPION	67	100.0	N	N	N
FOREST TRADER	215	93.4	Y	Y	N
FRANCES HAMMER	139	100.0	N	N	N
FRANCES L	187	100.0	N	N	N
FRANCESCO	204	100.0	N	N	N
FRANKFURT EXPRESS	35	100.0	N	N	N
FRED R. WHITE JR	58	60.3	Y	Y	N
GALAXY ACE	7	100.0	N	N	N
GALVESTON BAY	113	40.7	Y	Y	Y
GENEVIEVE LYKES	286	100.0	N	N	N
GEORGE A. SLOAN	291	100.0	N	N	N
GEORGE H. WEYERHAEUSER	167	100.0	N	N	N
GEORGE SCHULTZ	136	64.7	Y	Y	N
GEORGE WASHINGTON BRID	234	90.5	Y	N	N
GEORGIA RAINBOW II	126	100.0	Y	Y	Y
GERONIMO	32	50.0	Y	N	N

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED OCT	NOV	DEC
GINGA MARU	127	100.0	N	N	N
GLOBAL LINK	36	100.0	N	N	N
GLOBAL NEXTAGE	105	96.1	Y	Y	N
GLORIOUS SUCCESS	71	90.1	Y	Y	Y
GLORIOUS SUN	242	94.6	Y	Y	Y
GOLDEN APO	31	64.5	Y	N	N
GOLDEN BLISS	1	100.0	N	N	N
GOLDEN GATE	123	64.2	Y	Y	Y
GOLDEN GATE BRIDGE	156	100.0	Y	Y	Y
GOPHER STATE	167	100.0	N	N	N
GREAT LAND	19	100.0	N	N	N
GREEN BAY	196	31.6	Y	Y	Y
GREEN HARBOUR	25	36.0	Y	N	N
GREEN ISLAND	131	100.0	N	N	N
GREEN LAKE	145	100.0	Y	Y	Y
GREEN MAYA	29	100.0	N	N	N
GREEN RAINIER	25	100.0	N	N	N
GREEN RIDGE	150	40.6	Y	N	N
GREEN SASEBO	25	88.0	Y	Y	N
GREEN SYLVAN	58	86.2	Y	Y	N
GRETKE OLDENDORFF	112	75.8	Y	Y	Y
GROTON	43	100.0	Y	Y	Y
GROWTH RING	166	100.0	N	N	N
GUANAJUATO	57	100.0	Y	Y	Y
GUAYAMA	99	97.9	Y	Y	Y
GULF CURRENT	136	100.0	N	N	N
GULF SPIRIT	60	100.0	N	N	N
GULL ARROW	13	100.0	N	N	N
GYN YOH	72	94.4	Y	Y	Y
GYPSUM BARON	129	100.0	N	N	N
GYPSUM KING	78	100.0	N	N	N
HANDY BRAVE	136	0.0	Y	Y	N
HANDY ISLANDER	6	100.0	N	N	N
HANJIN BARCELONA	37	100.0	N	N	N
HANJIN BREMEN	16	100.0	N	N	N
HANJIN COLOMBO	39	100.0	N	N	N
HANJIN ELIZABETH	10	100.0	N	N	N
HANJIN FELIXSTOWE	16	100.0	N	N	N
HANJIN KAOHSIUNG	10	100.0	N	N	N
HANJIN LE HAVRE	28	100.0	N	N	N
HANJIN MARSEILLES	37	100.0	N	N	N
HANJIN OAKLAND	4	100.0	N	N	N
HANJIN PORTLAND	46	100.0	N	N	N
HANJIN ROTTERDAM	11	100.0	N	N	N
HANJIN SEATTLE	22	100.0	N	N	N
HANJIN SHANGHAI	31	100.0	N	N	N
HANJIN TOKYO	34	100.0	N	N	N
HANJIN VANCOUVER	7	100.0	N	N	N
HARBOUR BRIDGE	99	64.6	Y	Y	Y
HAVELLAND	73	100.0	N	N	N
HEICON	74	67.5	Y	N	N
HEIDELBERG EXPRESS	731	100.0	N	N	N
HELVETIA	92	100.0	Y	Y	Y
HENRY HUDSON BRIDGE	217	100.0	N	N	N
HERBERT C. JACKSON	56	94.6	Y	Y	N
HESIOD	194	100.0	N	N	N
HOEGH CLIPPER	6	100.0	N	N	N
HOEGH DRAKE	1	100.0	N	N	N
HOEGH DUKE	9	100.0	N	N	N
HOEGH DYKE	20	100.0	N	N	N
HOEGH MERIT	103	65.0	Y	Y	Y
HOEGH MINERVA	27	48.1	Y	N	N
HOLCK LARSEN	88	13.6	Y	Y	N
HOOD ISLAND	110	100.0	Y	Y	Y
HOUSTON	182	100.0	N	N	N
HOUSTON EXPRESS	30	100.0	N	N	N
HOWELL LYKES	113	45.1	Y	Y	Y
HUAL CARMENCITA	161	87.5	Y	Y	Y
HUAL INGRITA	20	100.0	Y	Y	Y
HUAL ROLITA	91	100.0	Y	Y	N
HUMACAO	178	30.8	Y	Y	Y
HUMBERGRACHT	76	100.0	N	N	N
HYUNDAI DYNASTY	259	85.3	Y	Y	Y
HYUNDAI FORTUNE	24	100.0	N	N	N
HYUNDAI FREEDOM	22	100.0	N	N	N
HYUNDAI INDEPENDENCE	7	100.0	N	N	N
HYUNDAI LIBERTY	14	100.0	N	N	N
HYUNDAI LONGVIEW	97	100.0	N	N	N
HYUNDAI PORTLAND	18	100.0	N	N	N
HYUNDAI TACOMA	33	81.8	Y	N	N
IGARKA	15	100.0	N	N	N
IMAGINATION	104	100.0	N	N	N
INDIANA HARBOR	184	82.6	Y	Y	N
INLAND SEAS	3	100.0	N	N	N
INSPIRATION	152	56.5	Y	Y	Y
IOWA TRADER	45	100.0	N	N	N
ISLAND BREEZE	2	100.0	N	N	N
ISLAND PRINCESS	9	100.0	N	N	N
ITB BALTIMORE	70	62.8	Y	Y	Y
ITB MOBILE	85	95.2	Y	N	N
ITB NEW YORK	41	24.3	Y	Y	Y
IVER EXPLORER	18	100.0	N	N	N
IVER EXPRESS	91	100.0	N	N	N
IWANUMA MARU	274	18.9	Y	Y	Y
J. DENNIS BONNEY	278	12.5	Y	Y	Y
JACKSONVILLE	172	81.9	Y	Y	Y
JADE ORIENT	32	100.0	N	N	N
JADE PACIFIC	50	100.0	N	N	N
JAHRE SPIRIT	35	100.0	N	N	N
JALAGOVIND	14	100.0	N	N	N
JAMES LYKES	1	100.0	N	N	N
JAMES R. BARKER	202	86.6	Y	Y	Y
JAPAN RAINBOW 2	173	39.3	Y	Y	Y
JAPAN SENATOR	44	100.0	N	N	N
JASMINE	97	100.0	N	N	N
JEAN LYKES	94	63.8	Y	Y	Y
JEBEL ALI	28	100.0	Y	N	N
JO ELM	72	100.0	N	N	N
JOHN G. MUNSON	160	88.1	Y	Y	N
JOHN J. BOLAND	4	100.0	N	N	N
JOHN YOUNG	168	0.0	Y	N	N
JOIDES RESOLUTION	312	73.3	Y	Y	Y
JOSEPH H. FRANTZ	185	77.2	Y	Y	N
JOSEPH L. BLOCK	48	70.8	Y	Y	N
JOSEPH LYKES	2	100.0	N	N	N
JUBILANT	13	100.0	N	N	N
JUBILEE	146	62.3	Y	Y	Y
JULIUS HAMMER	48	100.0	N	N	N
JUPITER DIAMOND	54	100.0	N	N	N
KAHO	14	0.0	Y	N	N
KAIJIN	42	100.0	N	N	N
KANSAS TRADER	160	93.7	Y	N	N
KAPITAN BYANKIN	162	100.0	Y	Y	Y
KAPITAN GNEZPILOV	36	100.0	N	N	N
KAPITAN KONEV	113	90.2	Y	Y	Y
KAPITAN MAN	72	100.0	N	N	N
KAPITAN SERYKH	69	97.1	Y	Y	N
KAREN ANDRIE	43	60.4	Y	N	N

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED OCT	NOV	DEC
KAUAI	167	79.0	Y	N	N
KAYE E. BARKER	268	100.0	N	N	N
KAZIMAH	262	100.0	N	N	N
KEE LUNG	19	100.0	N	N	N
KENAI	179	3.3	Y	Y	Y
KENNETH E. HILL	194	91.2	Y	Y	Y
KENNETH T. DERR	256	68.7	Y	Y	Y
KENTUCKY HIGHWAY	25	100.0	N	N	N
KINSMAN INDEPENDENT	270	61.8	Y	Y	Y
KITTANING	81	100.0	N	N	N
KNOCK ALLAN	91	100.0	N	N	N
KNORR	102	100.0	Y	Y	Y
KOELN EXPRESS	261	100.0	N	N	N
KOMET	96	45.8	Y	Y	N
KURAMA	15	100.0	N	N	N
KURE	77	64.9	Y	Y	Y
LA TRINITY	53	90.5	Y	Y	Y
LAKE CHARLES	26	100.0	N	N	N
LAWRENCE H. GIANELLA	120	75.0	Y	Y	N
LEE A. TREGURTHA	76	72.3	Y	Y	Y
LEGEND OF THE SEAS	113	82.3	Y	Y	Y
LEONARD J. COWLEY	14	100.0	N	N	N
LEONIA	47	100.0	N	N	N
LIBERTY STAR	46	100.0	N	N	N
LIBERTY SUN	113	56.6	Y	Y	Y
LIBERTY VICTORY	96	19.7	Y	Y	Y
LIBERTY WAVE	51	100.0	N	N	N
LIHUE	62	100.0	N	N	N
LILAC ACE	148	100.0	N	N	N
LINDA OLDENDORF	47	100.0	N	N	N
LIRCAY	141	100.0	Y	Y	Y
LNG AQUARIUS	119	100.0	N	N	N
LNG CAPRICORN	8	100.0	N	N	N
LNG LEO	98	61.2	Y	Y	Y
LNG LIBRA	109	20.1	Y	Y	Y
LNG TAURUS	135	47.4	Y	Y	Y
LNG VIRGO	77	0.0	Y	Y	Y
LONDON ENTERPRISE	13	100.0	N	N	N
LONDON SPIRIT	153	100.0	N	N	N
LONG BEACH	50	94.0	Y	Y	N
LONG LINES	48	100.0	N	N	N
LOOTSGRACHT	116	100.0	N	N	N
LT ARGOSY	13	100.0	N	N	N
LT. ODYSSEY	25	100.0	N	N	N
LTC CALVIN P. TITUS	43	39.5	Y	Y	Y
LUCKY	15	100.0	N	N	N
LUCKY BULKER	61	100.0	N	N	N
LUCKY GRACE	227	9.6	Y	Y	Y
LUCY OLDENDORFF	2	100.0	N	N	N
LUNA MAERSK	156	82.0	Y	Y	N
LURLINE	82	100.0	N	N	N
M/V TRUMP CASINO	3	100.0	N	N	N
MAASDAM	88	100.0	N	N	N
MACKINAC BRIDGE	223	99.1	Y	Y	Y
MADISON MAERSK	90	80.0	Y	Y	Y
MAERSK CHARLESTON	4	100.0	N	N	N
MAERSK CONSTELLATION	68	85.2	Y	N	N
MAERSK ENDEAVOUR	513	100.0	N	N	N
MAERSK EXPLORER	573	100.0	N	N	N
MAERSK GANNET	48	100.0	N	N	N
MAERSK GIANT	479	100.0	N	N	N
MAERSK LA PAZ	171	73.0	Y	Y	N
MAERSK SAO PAOLO	51	100.0	N	N	N
MAERSK SHETLAND	19	100.0	N	N	N
MAERSK SOMERSET	130	100.0	N	N	N
MAERSK STAFFORD	172	100.0	N	N	N
MAERSK SUN	78	100.0	N	N	N
MAERSK TANJONG	8	100.0	N	N	N
MAGIC	51	100.0	Y	Y	N
MAGLEBY MAERSK	113	45.1	Y	Y	Y
MAHARASHTRA	87	100.0	N	N	N
MAHIMAHI	242	89.2	Y	Y	Y
MAIRANGI BAY	209	100.0	N	N	N
MAJ STEPHEN W PLESS MP	74	51.3	Y	Y	N
MAJESTIC MAERSK	108	55.5	Y	Y	Y
MANGAL DESAI	55	100.0	N	N	N
MANHATTAN BRIDGE	144	46.5	Y	N	N
MANOA	132	55.3	Y	Y	Y
MANUKAI	173	100.0	N	N	N
MANULANI	224	100.0	N	N	N
MARCHEN MAERSK	113	100.0	N	N	N
MAREN MAERSK	106	47.1	Y	Y	Y
MARGARET LYKES	114	100.0	N	N	N
MARGRETHE MAERSK	96	16.6	Y	Y	Y
MARIA LAURA	54	100.0	N	N	N
MARIA TOPIC	54	100.0	N	N	N
MARIE MAERSK	89	100.0	N	N	N
MARINE EXPRESS	38	100.0	N	N	N
MARINE RELIANCE	95	100.0	N	N	N
MARIT MAERSK	115	58.2	Y	Y	Y
MARK HANNAH	48	100.0	N	N	N
MARLIN	101	100.0	N	N	N
MARY E. HANNAH	15	100.0	N	N	N
MATHILDE MAERSK	107	55.1	Y	N	N
MATSONIA	184	33.1	Y	N	N
MAUI	153	79.7	Y	Y	Y
MAURICE EWING	39	100.0	Y	Y	N
MAYAGUEZ	175	92.0	Y	Y	Y
MAYVIEW MAERSK	104	64.4	Y	Y	Y
MC-KINNEY MAERSK	113	65.4	Y	Y	Y
MEDALLION	72	100.0	Y	Y	Y
MEDUSA CHALLENGER	436	64.6	Y	Y	Y
MELBOURNE HIGHWAY	7	100.0	N	N	N
MELBOURNE STAR	174	100.0	N	N	N
MELVILLE	302	84.1	Y	Y	Y
MERCHANT PREMIER	78	100.0	N	N	N
MERIDA	142	83.8	Y	N	N
MERIDIAN	44	100.0	N	N	N
MERLION ACE	109	44.0	Y	Y	Y
MESABI MINER	137	72.2	Y	N	N
METEOR	389	100.0	N	N	N
METTE MAERSK	104	36.5	Y	Y	Y
MICHIGAN	332	46.6	Y	Y	Y
MIDDLETOWN	74	64.8	Y	Y	Y
MILDBURG	394	100.0	N	N	N
MING ASIA	13	100.0	N	N	N
MING PEACE	19	100.0	N	N	N
MING PLEASURE	142	100.0	N	N	N
MING PROPITIOUS	19	100.0	N	N	N
MITLA	52	67.3	Y	N	N
MOANA PACIFIC	59	100.0	N	N	N
MOANA WAVE	2	100.0	N	N	N
MOKIHANA	157	77.0	Y	Y	Y
MOKU PAHU	49	100.0	N	N	N
MONTERREY	189	100.0	N	N	N
MORELOS	274	94.8	Y	Y	Y
MORMACSKY	7	100.0	N	N	N
MORMACSTAR	42	38.0	Y	Y	Y

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED OCT	NOV	DEC
MORMACSUN	58	100.0	N	N	N
MOSEL ORE	251	85.6	Y	N	N
MSC JESSICA	123	100.0	N	N	N
MUNKEBO MAERSK	85	100.0	N	N	N
MYRON C. TAYLOR	137	87.5	Y	Y	N
NATIONAL DIGNITY	40	82.5	Y	N	N
NATIONAL HONOR	52	78.8	Y	Y	Y
NATIONAL PRIDE	77	50.6	Y	Y	Y
NAUTICAS MEXICO	67	100.0	N	N	N
NEDLLOYD DELFT	158	100.0	N	N	N
NEDLLOYD HOLLAND	230	100.0	N	N	N
NEDLLOYD RALEIGH BAY	70	100.0	N	N	N
NEDLLOYD VAN CLOON	52	100.0	N	N	N
NEDLLOYD VAN DAJIMA	193	100.0	N	N	N
NEDLLOYD VAN DIEMEN	140	100.0	N	N	N
NEGO LOMBOK	106	77.3	Y	Y	Y
NELVANA	119	73.9	Y	Y	Y
NEPTUNE ACE	70	100.0	N	N	N
NEPTUNE AKABAR	66	0.0	Y	N	N
NEPTUNE JADE	42	100.0	N	N	N
NEW CARISSA	245	72.2	Y	Y	Y
NEW HORIZON	70	100.0	N	N	N
NEW NIKKI	162	98.1	Y	Y	Y
NEW YORK SENATOR	78	100.0	N	N	N
NEW YORK SUN	33	100.0	N	N	N
NEWARK BAY	173	100.0	N	N	N
NEWPORT BRIDGE	61	100.0	N	N	N
NOAA DAVID STARR JORDA	118	30.5	Y	Y	N
NOAA SHIP ALBATROSS IV	58	100.0	N	N	N
NOAA SHIP CHAPMAN	368	84.2	Y	Y	Y
NOAA SHIP FERREL	421	100.0	N	N	N
NOAA SHIP KA'IMIMOANA	577	70.8	Y	Y	Y
NOAA SHIP MCARTHUR	135	96.2	Y	N	N
NOAA SHIP MILLER FREEM	460	62.8	Y	Y	N
NOAA SHIP OREGON II	254	80.3	Y	Y	N
NOAA SHIP RAINIER	129	65.1	Y	Y	N
NOAA SHIP T. CROMWELL	10	100.0	N	N	N
NOAA SHIP WHITING	250	80.8	Y	Y	N
NOBEL STAR	43	48.8	Y	N	N
NOBLEZA	45	100.0	Y	Y	Y
NOL AMBER	35	100.0	N	N	N
NOL DELPHI	154	100.0	N	N	N
NOL DIAMOND	5	100.0	N	N	N
NOL RISSO	145	100.0	N	N	N
NOL RUBY	65	100.0	N	N	N
NOL STENO	254	100.0	N	N	N
NOL TOPAZ	19	100.0	N	N	N
NOL ZIRCON	4	100.0	N	N	N
NOLIZWE	161	100.0	N	N	N
NOMZI	575	95.4	Y	Y	Y
NORD JAHRE TRANSPORTER	23	100.0	N	N	N
NORD PARTNER	27	100.0	N	N	N
NORDIC EMPRESS	45	86.6	Y	Y	N
NORDMAX	449	32.9	Y	Y	N
NORTHERN LIGHTS	75	94.6	Y	Y	Y
NORTHERN LION	87	100.0	N	N	N
NORWAY	28	46.4	Y	N	N
NOSAC EXPLORER	1	100.0	N	N	N
NTABENI	141	100.0	N	N	N
NUERNBERG EXPRESS	506	100.0	N	N	N
NUEVO LEON	136	100.0	N	N	N
NUEVO SAN JUAN	213	30.9	Y	Y	Y
NYK SEABREEZE	101	100.0	N	N	N
NYK SPRINGTIDE	45	100.0	N	N	N
NYK STARLIGHT	37	100.0	N	N	N
NYK SUNRISE	98	100.0	N	N	N
NYK SURFWIND	64	100.0	N	N	N
OBO ENGIN	24	100.0	N	N	N
OCEAN CITY	6	100.0	N	N	N
OCEAN GREAT	46	100.0	N	N	N
OCEAN HARMONY	55	100.0	N	N	N
OCEAN JADE	122	100.0	N	N	N
OCEAN LAUREL	35	94.2	Y	Y	Y
OCEAN ORCHID	40	65.0	Y	Y	Y
OCEAN SERENE	73	95.8	Y	N	N
OCEANBREEZE	20	95.0	Y	N	N
OJI PIONEER	228	51.7	Y	Y	Y
OLEANDER	146	88.3	Y	Y	Y
OLIVEBANK	208	100.0	N	N	N
OMI COLUMBIA	110	100.0	N	N	N
OOCL AMERICA	141	95.7	Y	Y	Y
OOCL BRAVERY	53	100.0	N	N	N
OOCL CALIFORNIA	59	100.0	Y	N	N
OOCL CHINA	174	94.2	Y	Y	Y
OOCL ENVOY	16	100.0	N	N	N
OOCL FAIR	124	74.1	Y	Y	Y
OOCL FAME	89	78.6	Y	Y	Y
OOCL FIDELITY	141	100.0	N	N	N
OOCL FORTUNE	89	100.0	N	N	N
OOCL FREEDOM	120	100.0	N	N	N
OOCL FRONTIER	99	82.8	Y	Y	Y
OOCL HONG KONG	96	89.5	Y	Y	Y
OOCL INNOVATION	264	19.3	Y	Y	Y
OOCL INSPIRATION	193	91.1	Y	Y	Y
OOCL JAPAN	181	100.0	N	N	N
ORANGE BLOSSOM	334	0.2	Y	N	N
ORANGE WAVE	14	100.0	N	N	N
OREGON RAINBOW III	1	100.0	N	N	N
ORIENTE GRACE	98	97.9	Y	Y	Y
ORIENTE HOPE	20	100.0	N	N	N
ORIENTE NOBLE	193	21.7	Y	Y	Y
ORIENTE PRIME	38	100.0	N	N	N
ORION HIGHWAY	205	98.5	Y	Y	Y
OURO DO BRASIL	24	100.0	Y	Y	N
OVERSEAS ALASKA	28	46.4	Y	N	N
OVERSEAS ALICE	25	100.0	N	N	N
OVERSEAS CHICAGO	50	100.0	N	N	N
OVERSEAS HARRIET	36	100.0	N	N	N
OVERSEAS JOYCE	57	100.0	Y	Y	N
OVERSEAS JUNEAU	113	0.0	Y	N	N
OVERSEAS MARILYN	46	58.6	Y	Y	Y
OVERSEAS NEW ORLEANS	66	100.0	N	N	N
OVERSEAS NEW YORK	77	23.3	Y	Y	Y
OVERSEAS OHIO	52	100.0	N	N	N
OVERSEAS WASHINGTON	32	100.0	N	N	N
PACASIA	132	72.7	Y	Y	Y
PACDUKE	40	100.0	N	N	N
PACIFIC HIRO	200	68.0	Y	Y	Y
PACIFIC HOPE	141	46.8	Y	Y	Y
PACIFIC PRINCESS	28	100.0	N	N	N
PACIFIC RAINBOW II	106	72.6	Y	Y	Y
PACIFIC WAVE	112	100.0	N	N	N
PACMERCHANT	36	100.0	N	N	N
PACPRINCE	26	100.0	N	N	N
PACPRINCESS	16	100.0	N	N	N
PACQUEEN	1	100.0	N	N	N
PACROSE	42	61.9	Y	Y	Y
PACSEA	125	48.8	Y	Y	Y

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED OCT	NOV	DEC
PATRIOT	117	100.0	N	N	N
PAUL BUCK	125	48.8	Y	N	N
PAUL R. TREGURTHA	233	76.8	Y	Y	Y
PEARL REEFER	26	100.0	N	N	N
PEGGY DOW	89	100.0	N	N	N
PFC EUGENE A. OBREGON	30	53.3	Y	Y	Y
PFC JAMES ANDERSON JR	5	100.0	N	N	N
PFC WILLIAM B. BAUGH	34	17.6	Y	N	N
PHAROS	122	100.0	N	N	N
PHILADELPHIA	168	37.5	Y	Y	Y
PHILIP R. CLARKE	191	100.0	N	N	N
PHOENIX DIAMOND	49	75.5	Y	Y	Y
PINO GLORIA	123	30.0	Y	Y	Y
PISCES PIONEER	6	100.0	N	N	N
POLAR EAGLE	128	8.5	Y	Y	Y
POLYNESIA	212	97.1	Y	Y	Y
POTOMAC TRADER	57	100.0	N	N	N
POYANG	150	100.0	N	N	N
POYARKOVO	6	100.0	N	N	N
PRESIDENT ADAMS	151	88.7	Y	Y	Y
PRESIDENT EISENHOWER	261	100.0	N	N	N
PRESIDENT F. ROOSEVELT	250	84.4	Y	Y	Y
PRESIDENT JACKSON	164	87.1	Y	N	N
PRESIDENT KENNEDY	137	100.0	N	N	N
PRESIDENT POLK	190	82.6	Y	Y	Y
PRESIDENT TRUMAN	92	67.3	Y	Y	Y
PRESQUE ISLE	268	51.1	Y	Y	Y
PRIDE OF BALTIMORE II	96	86.4	Y	Y	N
PRINCE OF OCEAN	56	100.0	N	N	N
PRINCE OF TOKYO 2	251	48.2	Y	Y	Y
PRINCE WILLIAM SOUND	173	100.0	N	N	N
PRINCESS OF SCANDINAVI	279	100.0	N	N	N
PROJECT ORIENT	190	100.0	N	N	N
PUERTO CORTES	98	100.0	N	N	N
PVT FRANKLIN J. PHILLI	30	60.0	Y	Y	Y
PYTCHLEY	229	100.0	N	N	N
QUEEN ELIZABETH 2	67	100.0	N	N	N
QUEEN OF SCANDINAVIA	278	100.0	N	N	N
QUEENSLAND STAR	114	100.0	N	N	N
R. HAL DEAN	38	100.0	N	N	N
R.J. PFEIFFER	107	42.0	Y	Y	Y
RANI PADMINI	74	100.0	N	N	N
RAYMOND E. GALVIN	101	70.2	Y	Y	Y
REGAL PRINCESS	99	63.6	Y	Y	Y
REGINA J	13	100.0	N	N	N
REPULSE BAY	169	100.0	N	N	N
RESERVE	30	100.0	N	N	N
RESOLUTE	144	29.1	Y	Y	Y
RHINE FOREST	146	35.6	Y	Y	Y
RICHARD G MATTHIESEN	8	100.0	Y	N	N
RICHARD REISS	63	58.7	Y	Y	N
ROBERT E. LEE	69	47.8	Y	N	N
ROGER BLOUGH	390	82.8	Y	Y	Y
ROGER REVELLE	98	77.5	Y	Y	Y
ROSINA TOPIC	11	100.0	N	N	N
ROSITA	217	65.8	Y	Y	Y
ROVER	13	100.0	N	N	N
ROYAL MAJESTY	62	43.5	Y	Y	N
ROYAL PRINCESS	17	100.0	N	N	N
RUBIN KOBE	141	100.0	N	N	N
RUBIN PEARL	75	45.3	Y	Y	Y
RUBIN ROSE	81	100.0	N	N	N
RUBIN STAR	44	100.0	N	N	N
RUBIN STELLA	188	22.8	Y	Y	Y
RYNDAM	68	100.0	N	N	N
S.T. CRAPO	58	100.0	N	N	N
SAGA CREST	34	100.0	N	N	N
SALINAS	34	100.0	N	N	N
SALOME	167	71.2	Y	N	N
SAM HOUSTON	44	100.0	N	N	N
SAMUEL GINN	27	100.0	N	N	N
SAMUEL H. ARMACOST	27	100.0	N	N	N
SAMUEL L. COBB	6	100.0	N	N	N
SAMUEL RISLEY	380	100.0	N	N	N
SAN FELIPE	15	100.0	N	N	N
SAN FERNANDO	11	100.0	N	N	N
SAN ISIDRO	33	100.0	N	N	N
SAN MARCOS	48	100.0	Y	Y	Y
SAN VINCENTE	64	100.0	N	N	N
SANKO SPRUCE	127	44.8	Y	Y	N
SANTA CHRISTINA	58	100.0	N	N	N
SANTORIN 2	351	68.0	Y	Y	Y
SARAJEVO EXPRESS	36	100.0	N	N	N
SARAMATI	139	51.0	Y	Y	Y
SAUDI ABHA	8	100.0	N	N	N
SAUDI QASSIM	36	100.0	N	N	N
SAVANNAH	5	100.0	N	N	N
SC HORIZON	45	100.0	N	N	N
SCHACKENBORG	10	100.0	N	N	N
SEA COMMERCE	111	83.7	Y	Y	Y
SEA FLORIDA	154	87.0	Y	Y	Y
SEA FOX	219	100.0	N	N	N
SEA HARMONY	28	100.0	N	N	N
SEA INITIATIVE	49	100.0	N	N	N
SEA ISLE CITY	55	100.0	N	N	N
SEA JUSTICE	37	94.5	Y	N	N
SEA LION	454	96.0	Y	Y	N
SEA MARINER	189	63.4	Y	Y	Y
SEA MERCHANT	426	88.7	Y	Y	Y
SEA NOVIA	45	91.1	Y	N	N
SEA PRINCESS	92	88.0	Y	Y	N
SEA RACER	14	100.0	N	N	N
SEA SPRAY	3	100.0	N	N	N
SEA TRADE	193	93.7	Y	Y	Y
SEA WOLF	115	68.6	Y	Y	Y
SEA/LAND VICTORY	147	100.0	N	N	N
SEABOARD OCEAN	142	100.0	N	N	N
SEABOARD SUN	55	0.0	Y	Y	Y
SEABOARD UNIVERSE	90	4.4	Y	Y	Y
SEABREEZE I	50	42.0	Y	Y	Y
SEACHAMPION	181	90.0	Y	Y	Y
SEALAND ANCHORAGE	120	52.5	Y	Y	Y
SEALAND ATLANTIC	209	68.8	Y	N	N
SEALAND CHALLENGER	132	38.6	Y	Y	Y
SEALAND CHAMPION	91	100.0	Y	Y	Y
SEALAND COMET	120	88.3	Y	Y	Y
SEALAND CONSUMER	44	100.0	N	N	N
SEALAND CRUSADER	134	93.2	Y	Y	Y
SEALAND DEFENDER	225	57.7	Y	Y	Y
SEALAND DEVELOPER	211	26.5	Y	Y	Y
SEALAND DISCOVERY	146	33.5	Y	Y	Y
SEALAND ENDURANCE	132	35.6	Y	Y	Y
SEALAND ENTERPRISE	242	95.0	Y	Y	Y
SEALAND EXPEDITION	2	100.0	N	N	N
SEALAND EXPLORER	136	61.0	Y	Y	Y
SEALAND EXPRESS	140	85.7	Y	Y	Y
SEALAND FREEDOM	205	43.9	Y	Y	N
SEALAND HAWAII	50	100.0	N	N	N

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED OCT	NOV	DEC
SEALAND INDEPENDENCE	134	44.0	Y	Y	Y
SEALAND INNOVATOR	136	86.0	Y	Y	Y
SEALAND INTEGRITY	432	77.0	Y	N	N
SEALAND KODIAK	111	55.8	Y	Y	Y
SEALAND LIBERATOR	145	47.5	Y	Y	Y
SEALAND MARINER	124	100.0	N	N	N
SEALAND MERCURY	164	54.2	Y	N	N
SEALAND METEOR	120	92.5	Y	Y	Y
SEALAND NAVIGATOR	243	97.5	Y	Y	Y
SEALAND PACER	44	72.7	Y	Y	Y
SEALAND PACIFIC	272	88.6	Y	Y	Y
SEALAND PATRIOT	274	21.8	Y	Y	Y
SEALAND PERFORMANCE	185	65.4	Y	Y	Y
SEALAND PRODUCER	142	100.0	Y	Y	Y
SEALAND QUALITY	105	39.0	Y	Y	Y
SEALAND RACER	65	100.0	N	N	N
SEALAND RELIANCE	265	56.9	Y	Y	Y
SEALAND SPIRIT	59	52.5	Y	N	N
SEALAND TACOMA	100	46.0	Y	N	N
SEALAND TRADER	222	85.1	Y	N	N
SEALAND VOYAGER	140	87.8	Y	Y	Y
SEARIVER BATON ROUGE	27	70.3	Y	N	N
SEARIVER BENICIA	34	100.0	N	N	N
SEARIVER LONG BEACH	29	100.0	N	N	N
SEARIVER NORTH SLOPE	5	100.0	N	N	N
SEARIVER SAN FRANCISCO	7	100.0	N	N	N
SEIJIN	34	100.0	N	N	N
SEILLEAN	318	100.0	N	N	N
SENATOR	67	100.0	N	N	N
SENORITA	108	100.0	N	N	N
SENSATION	134	60.4	Y	Y	Y
SETO BRIDGE	151	100.0	N	N	N
SEVEN OCEAN	59	93.2	Y	N	N
SEWARD JOHNSON	87	100.0	Y	Y	N
SGT WILLIAM A BUTTON	7	100.0	N	N	N
SGT. METEJ KOCAK	58	75.8	Y	Y	Y
SHELLY BAY	115	100.0	N	N	N
SHIN OJI	76	100.0	N	N	N
SHIRAOI MARU	129	84.4	Y	Y	N
SIBOHELLE	35	100.0	N	N	N
SIDNEY STAR	144	100.0	N	N	N
SIERRA MADRE	21	100.0	N	N	N
SIGAL	210	36.1	Y	Y	Y
SINCERE GEMINI	49	100.0	N	N	N
SINCERE SUCCESS	125	100.0	Y	Y	Y
SKANDERBORG	21	100.0	N	N	N
SKAUBRYN	95	100.0	N	N	N
SKAUGRAN	101	100.0	N	N	N
SKOGAFOSS	102	100.0	N	N	N
SKY PRINCESS	83	100.0	N	N	N
SNOW CRYSTAL	91	100.0	N	N	N
SOKOLICA	42	88.0	Y	N	N
SOL DO BRASIL	75	74.6	Y	Y	Y
SOLAR WING	91	100.0	N	N	N
SONG OF AMERICA	16	100.0	Y	Y	Y
SONORA	161	65.8	Y	N	N
SOREN TOUBRO	26	100.0	N	N	N
SOUTH FORTUNE	102	66.6	Y	Y	N
SOUTHERN LION	2	100.0	N	N	N
SOVEREIGN OF THE SEAS	18	83.3	N	N	N
SP5. ERIC G. GIBSON	54	83.3	Y	N	N
SPAR EIGHT	163	58.2	Y	Y	Y
SPRING BEAR	227	100.0	N	N	N
SPRING GANNET	217	100.0	N	N	N
SPRING WAVE	53	50.9	Y	Y	Y
ST BLAIZE	66	100.0	N	N	N
STAR AMERICA	107	46.7	Y	Y	Y
STAR EAGLE	41	100.0	N	N	N
STAR EVVIVA	118	55.0	Y	N	N
STAR FRASER	85	100.0	N	N	N
STAR FUJI	67	100.0	N	N	N
STAR GRAN	80	100.0	N	N	N
STAR HANSA	61	100.0	Y	N	N
STAR HERDLA	128	100.0	N	N	N
STAR SKARVEN	90	37.7	Y	Y	Y
STAR STRONEN	74	100.0	N	N	N
STATE OF GUIARAT	1	100.0	N	N	N
STATENDAM	55	100.0	N	N	N
STELLA	4	100.0	N	N	N
STELLA LYKES	127	47.2	Y	Y	Y
STEPAN KRASHENINNIKOV	17	100.0	N	N	N
STEPHAN J	262	96.5	Y	Y	Y
STEWART J. CORT	283	87.6	Y	Y	Y
STOLT CONDOR	25	100.0	N	N	N
STOLT TENACITY	80	100.0	N	N	N
STONEWALL JACKSON	25	100.0	N	N	N
STRONG CAJUN	105	63.8	Y	Y	Y
STRONG ICELANDER	74	100.0	N	N	N
STRONG VIRGINIAN	85	100.0	N	N	N
SUN DANCE	29	96.5	Y	Y	N
SUN PRINCESS	66	72.7	Y	Y	Y
SUNBELT DIXIE	31	96.7	Y	Y	Y
SUNDA	216	100.0	N	N	N
SUNSHINE AMAZON	238	100.0	N	N	N
SUPER RUBIN	179	94.9	Y	Y	Y
SVEN OLTMANN	138	100.0	N	N	N
SWAN ARROW	10	100.0	N	N	N
TAGUS	68	100.0	N	N	N
TAI HE	240	100.0	N	N	N
TAI SHING	44	100.0	N	N	N
TAKARA	164	15.2	Y	N	N
TAKAYAMA	93	100.0	N	N	N
TALLAHASSEE BAY	27	100.0	N	N	N
TAMATIKI	2	100.0	N	N	N
TAMPA BAY	44	100.0	N	N	N
TANABATA	24	100.0	N	N	N
TARAGO	135	100.0	N	N	N
TELLUS	170	100.0	Y	Y	Y
TEPOZTECO II	93	100.0	N	N	N
TEQUI	119	94.9	Y	Y	Y
TEUTONIA	48	100.0	N	N	N
THOMAS G. THOMPSON	10	100.0	N	N	N
THOMPSON LYKES	86	48.8	Y	Y	Y
THORKIL MAERSK	7	100.0	N	N	N
THORNHILL	62	100.0	N	N	N
TILLIE LYKES	181	45.8	Y	Y	Y
TJALDRID	33	100.0	N	N	N
TMM MEXICO	145	100.0	N	N	N
TMM VERACRUZ	96	90.6	Y	Y	Y
TOKIO EXPRESS	362	100.0	N	N	N
TOLUCA	162	100.0	N	N	N
TONSINA	122	100.0	N	N	N
TORBEN	132	85.6	Y	Y	Y
TORM FREYA	61	100.0	N	N	N
TOWER BRIDGE	42	100.0	N	N	N
TRANSWORLD BRIDGE	126	82.5	Y	Y	Y
TRIGGER	42	2.3	Y	Y	N
TRITON	217	100.0	N	N	N

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED OCT	NOV	DEC
TROPIC DAY	64	0.0	Y	Y	Y
TROPIC FLYER	23	100.0	N	N	N
TROPIC ISLE	61	100.0	N	N	N
TROPIC JADE	67	100.0	N	N	N
TROPIC KEY	20	5.0	Y	Y	N
TROPIC LURE	86	100.0	N	N	N
TROPIC MIST	80	0.0	Y	Y	Y
TROPIC PALM	13	100.0	N	N	N
TROPIC SUN	169	75.7	Y	Y	Y
TROPIC TIDE	58	100.0	N	N	N
TROPICALE	12	100.0	N	N	N
TRSL ARCTURUS	53	100.0	N	N	N
TRUST 38	137	12.4	Y	Y	Y
TSL GALLANT	55	100.0	N	N	N
TULSIDAS	16	100.0	N	N	N
TURMOIL	114	100.0	N	N	N
TYSON LYKES	133	36.0	Y	Y	Y
ULLSWATER	169	100.0	N	N	N
USCGC ACACIA (WLB406)	63	100.0	N	N	N
USCGC ACTIVE WMEC 618	61	72.1	Y	N	N
USCGC ACUSHNET WMEC 16	22	100.0	N	N	N
USCGC ADAK	4	100.0	N	N	N
USCGC ALERT (WMEC 630)	90	100.0	N	N	N
USCGC BASSWOOD (WLB 38	17	100.0	N	N	N
USCGC BEAR (WEMC 901)	6	100.0	N	N	N
USCGC BOUTWELL WHEC 71	54	100.0	N	N	N
USCGC CAMPBELL	21	100.0	N	N	N
USCGC CHASE (WHEC 718)	42	90.4	Y	N	N
USCGC CONFIDENCE WMEC6	31	100.0	N	N	N
USCGC COURAGEOUS	32	100.0	N	N	N
USCGC DAUNTLESS WMEC 6	95	31.5	Y	Y	N
USCGC DILIGENCE WMEC 6	41	100.0	N	N	N
USCGC DURABLE (WMEC 62	5	100.0	N	N	N
USCGC FIREBUSH WLB 393	13	100.0	N	N	N
USCGC FORWARD	79	100.0	N	N	N
USCGC HARRIET LANE	93	100.0	N	N	N
USCGC IRONWOOD (WLB 29	29	100.0	N	N	N
USCGC JARVIS (WHEC 725	88	100.0	N	N	N
USCGC LEGARE	31	100.0	N	N	N
USCGC MALLOW (WLB 396)	61	100.0	N	N	N
USCGC MELLON (WHEC 717	71	100.0	N	N	N
USCGC MIDGETT (WHEC 72	81	100.0	N	N	N
USCGC MOBILE BAY	6	100.0	N	N	N
USCGC MOHAWK WMEC 913	27	100.0	N	N	N
USCGC MORGENTHAU	94	100.0	N	N	N
USCGC MUNRO	126	100.0	N	N	N
USCGC NORTHLAND WMEC 9	52	71.1	Y	Y	Y
USCGC POLAR SEA_(WAGB	50	100.0	N	N	N
USCGC RELIANCE WMEC 61	27	100.0	N	N	N
USCGC RUSH	6	100.0	N	N	N
USCGC SASSAFRAS	9	100.0	N	N	N
USCGC SEDGE (WLB 402)	12	100.0	N	N	N
USCGC SENECA	38	100.0	N	N	N
USCGC SHERMAN	63	76.1	Y	N	N
USCGC SPENCER	9	100.0	N	N	N
USCGC STEADFAST (WMEC	69	39.1	Y	Y	N
USCGC STORIS (WMEC 38)	146	100.0	N	N	N
USCGC SUNDEW (WLB 404)	11	100.0	N	N	N
USCGC SWEETBRIER WLB 4	4	100.0	N	N	N
USCGC TAHOMA	24	100.0	Y	N	N
USCGC THETIS	96	4.1	Y	Y	Y
USCGC VALIANT (WMEC 62	51	100.0	N	N	N
USCGC VENTUROUS WMEC 6	106	23.5	Y	Y	N
USCGC VIGILANT WMEC 61	68	100.0	N	N	N
USCGC VIGOROUS WMEC 62	55	100.0	N	N	N
USCGC WOODRUSH (WLB 40	12	100.0	N	N	N
USNS APACHE (T-ATF 172	43	100.0	N	N	N
USNS BELLATRIX	25	100.0	N	N	N
USNS CAPELLA	9	100.0	N	N	N
USNS GUADALUPE	3	100.0	N	N	N
USNS GUS W. DARNELL	179	36.3	Y	Y	Y
USNS HENRY J. KAISER	20	100.0	N	N	N
USNS JOHN MCDONNELL (T	50	62.0	Y	Y	Y
USNS KANE TAGS 27	90	60.0	Y	Y	Y
USNS MOHAWK (T-ATF 170	59	100.0	N	N	N
USNS NARRAGANSETT	104	100.0	N	N	N
USNS NAVAJO_(TATF-169)	6	100.0	N	N	N
USNS PATHFINDER T-AGS	232	65.9	Y	Y	Y
USNS PATUXENT	143	69.2	Y	Y	Y
USNS POWHATAN TATF 166	75	100.0	N	N	N
USNS RAPPAHANNOCK TAO-	16	100.0	N	N	N
USNS SATURN T-AFS-10	144	0.0	Y	Y	Y
USNS SILAS BENT T-AGS	114	58.7	Y	Y	Y
USNS TIPPECANOE (TAO-1	101	100.0	N	N	N
USNS VANGUARD TAG 194	59	100.0	N	N	N
USNS WALTER S. DIEHL	18	100.0	N	N	N
USNS YUKON (T-AO 202)	141	52.4	Y	Y	Y
USS RUSSELL DDG-59	84	100.0	N	N	N
VASILTY BURKHANOV	227	100.0	N	N	N
VEGA	6	100.0	N	N	N
VENUS DIAMOND	1	100.0	N	N	N
VINE	234	100.0	N	N	N
VIRGINIA	307	16.6	Y	Y	Y
VISAYAN GLORY	160	51.8	Y	Y	Y
WALTER J. MCCARTHY	114	67.5	Y	Y	Y
WESTERBROOK	77	54.5	Y	N	N
WESTERN FRIEND	121	35.5	Y	Y	N
WESTERN LION	81	100.0	N	N	N
WESTWARD	18	100.0	N	N	N
WESTWARD VENTURE	427	78.4	Y	Y	Y
WESTWOOD ANETTE	108	74.0	Y	N	N
WESTWOOD BELINDA	193	100.0	N	N	N
WESTWOOD CLEO	160	57.5	Y	Y	Y
WESTWOOD FUJI	204	81.3	Y	Y	Y
WESTWOOD HALLA	140	99.2	Y	Y	Y
WESTWOOD JAGO	220	52.7	Y	Y	Y
WESTWOOD MARIANNE	144	100.0	N	N	N
WILFRED SYKES	37	100.0	N	N	N
WILLIAM E. CRAIN	126	0.0	Y	Y	Y
WILLIAM E. MUSSMAN	136	49.2	Y	Y	Y
WOLVERINE	186	67.2	Y	Y	Y
YOHFU	80	25.0	Y	Y	N
YUCATAN	5	100.0	N	N	N
YURIY OSTROVSKIY	213	94.3	Y	Y	Y
ZAGREB EXPRESS	13	100.0	N	N	N
ZENITH	24	100.0	N	N	N
ZETLAND	239	100.0	N	N	N
ZIM AMERICA	78	100.0	N	N	N
ZIM ASIA	199	100.0	N	N	N
ZIM CANADA	76	100.0	N	N	N
ZIM IBERIA	56	100.0	N	N	N
ZIM ISRAEL	30	100.0	N	N	N
ZIM ITALIA	126	100.0	N	N	N
ZIM JAPAN	64	100.0	N	N	N
ZIM KEELUNG	59	100.0	N	N	N
ZIM KOREA	54	100.0	N	N	N
ZIM MONTEVIDEO	33	100.0	N	N	N
ZIM PACIFIC	120	100.0	N	N	N
GRAND TOTAL	115,636				
TOTAL VIA RADIO	88,773				
PERCENT VIA RADIO	76.7				

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED JAN	FEB	MAR
1ST LT ALEX BONNYMAN	19	31.5	Y	Y	Y
1ST LT BALDOMERO LOPEZ	18	11.1	Y	N	N
2ND LT. JOHN P. BOBO	84	88.0	Y	N	Y
A. V. KASTNER	131	100.0	N	N	N
AALSMEERGRACHT	143	100.0	N	N	N
ACADIA FOREST	163	60.7	Y	Y	Y
ACT 7	181	100.0	N	N	N
ACT I	174	100.0	N	N	N
ADAM E. CORNELIUS	4	75.0	Y	N	N
ADDIRIYAH	43	100.0	N	Y	N
ADVANTAGE	25	100.0	Y	Y	Y
AGULHAS	112	26.7	Y	N	N
AL AWDAH	24	100.0	N	N	N
AL SAMIDOON	568	100.0	N	N	N
AL SHUHADAA	43	100.0	N	N	N
AL WATTAYAH	78	100.0	N	N	N
ALBEMARLE ISLAND	1	100.0	N	N	N
ALBERNI DAWN	151	100.0	N	N	N
ALDEN W. CLAUSEN	107	28.9	Y	Y	Y
ALKMAN	184	100.0	N	N	N
ALLIGATOR AMERICA	96	100.0	N	N	N
ALLIGATOR BRAVERY	128	98.4	Y	Y	Y
ALLIGATOR COLUMBUS	139	59.7	Y	Y	Y
ALLIGATOR GLORY	50	82.0	Y	Y	Y
ALLIGATOR LIBERTY	196	100.0	N	N	N
ALLIGATOR STRENGTH	165	48.4	Y	Y	Y
ALLIGATOR VICTORY	4	100.0	N	N	N
ALMANIA	20	90.0	Y	Y	Y
ALMERIA LYKES	124	43.5	Y	Y	Y
ALPENA	28	75.0	N	N	Y
ALTONA	27	96.2	Y	Y	Y
AMALIA	12	100.0	Y	Y	Y
AMAZON	60	96.6	Y	Y	Y
AMBASSADOR	35	97.1	Y	Y	Y
AMBASSADOR BRIDGE	213	94.3	Y	Y	Y
AMERICA STAR	180	100.0	N	N	N
AMERICAN CONDOR	244	0.0	Y	Y	Y
AMERICAN FALCON	156	14.7	Y	Y	Y
AMERICANA	47	29.7	Y	Y	Y
AMERIGO VESPUCCI	32	34.3	Y	N	N
ANASTASIS	5	100.0	N	N	N
ANATOLIY KOLESNICHENKO	52	100.0	N	N	N
ANDERS MAERSK	172	50.0	Y	Y	Y
ANGLIAN REEFER	123	82.9	Y	Y	N
ANNA MAERSK	196	48.9	Y	Y	Y
AOMORI WILLOW	85	94.1	Y	Y	Y
APL CHINA	164	100.0	N	N	N
APL JAPAN	124	63.7	Y	Y	Y
APL KOREA	114	100.0	N	N	N
APL PHILIPPINES	168	91.0	Y	N	N
APL SINGAPORE	63	100.0	N	N	N
APL THAILAND	288	92.0	Y	N	N
ARABIAN SEA	49	63.2	Y	Y	Y
ARABIAN SENATOR	139	100.0	N	N	N
ARCO ALASKA	48	83.3	N	Y	Y
ARCO CALIFORNIA	57	45.6	Y	Y	Y
ARCO FAIRBANKS	23	69.5	N	Y	Y
ARCO INDEPENDENCE	56	16.0	Y	Y	Y
ARCO JUNEAU	34	50.0	Y	Y	Y
ARCO SPIRIT	45	17.7	N	Y	Y
ARCTIC SUN	159	50.3	Y	Y	Y
ARCTIC UNIVERSAL	28	100.0	N	N	N
ARGONAUT	100	27.0	Y	Y	Y
ARIES	77	53.2	Y	Y	N
ARKTIS LIGHT	210	67.1	Y	Y	Y
ARKTIS SPRING	46	69.5	N	N	Y
ARKTIS SUN	17	100.0	N	N	N
ARMCO	7	100.0	N	N	Y
ARTHUR M. ANDERSON	15	93.3	N	N	Y
ARTHUR MAERSK	221	72.3	Y	Y	Y
ASPHALT COMMANDER	2	0.0	N	N	Y
ATLANTA BAY	2	100.0	N	N	N
ATLANTIC	651	100.0	N	N	N
ATLANTIC BRIDGE	6	100.0	N	N	N
ATLANTIC BULKER	84	83.3	N	Y	Y
ATLANTIC COMPANION	84	100.0	N	N	N
ATLANTIC COMPASS	91	100.0	N	N	N
ATLANTIC CONCERT	39	100.0	N	N	N
ATLANTIC CONVEYOR	27	100.0	N	N	N
ATLANTIC HURON	51	100.0	N	N	N
ATLANTIC SUPERIOR	26	100.0	N	N	N
AUCKLAND STAR	151	100.0	N	N	N
AUSTRAL RAINBOW	13	100.0	N	N	N
AUTHOR	75	100.0	N	N	N
AXEL MAERSK	153	36.6	Y	Y	Y
B.T. ALASKA	62	38.7	Y	Y	N
BANDA SEAHORSE	305	66.2	Y	Y	Y
BARRINGTON ISLAND	136	38.9	Y	Y	Y
BAY BRIDGE	123	12.1	Y	Y	Y
BELGRANO	113	68.1	N	N	Y
BERING SEA	145	93.7	Y	Y	Y
BERNARDO QUINTANA A	174	97.7	Y	N	Y
BLUE GEMINI	88	51.1	Y	Y	Y
BLUE NOVA	109	33.0	Y	Y	Y
BOHINJ	10	0.0	Y	N	N
BONN EXPRESS	191	100.0	N	N	N
BOSPORUS BRIDGE	227	64.3	Y	Y	Y
BP ADMIRAL	19	100.0	N	N	N
BREMEN EXPRESS	50	100.0	N	N	N
BRIGHT PHOENIX	204	92.1	Y	Y	Y
BRIGIT MAERSK	1	100.0	N	N	N
BRISBANE STAR	112	100.0	N	N	N
BRITISH ADVENTURE	130	100.0	N	N	N
BRITISH RANGER	228	100.0	N	N	N
BROOKLYN BRIDGE	224	93.7	Y	Y	Y
BRUCE SMART	132	8.3	Y	Y	Y
BT NAVIGATOR	75	100.0	N	N	N
BT NIMROD	46	100.0	N	N	N
BUCKEYE	5	100.0	Y	N	Y
BUFFALO SOLDIER	13	100.0	Y	N	N
BUNGA SAGA TIGA	147	86.3	Y	Y	Y
BURNS HARBOR	79	16.4	Y	N	Y
C.S. IRIS	21	100.0	N	N	N
CABO TAMAR	39	94.8	N	N	Y
CALIFORNIA CURRENT	150	100.0	N	N	N
CALIFORNIA HIGHWAY	17	100.0	N	N	N
CALIFORNIA JUPITER	82	100.0	N	N	N
CALIFORNIA LUNA	78	100.0	N	N	N
CALIFORNIA MERCURY	52	100.0	N	N	N
CALIFORNIA PEGASUS	83	100.0	N	N	N
CALIFORNIA SATURN	42	100.0	Y	Y	Y
CALIFORNIA TRITON	88	89.7	Y	N	N
CALIFORNIA ZEUS	92	86.9	Y	Y	N
CAPE BREEZE	153	100.0	N	N	N
CAPE CHARLES	66	100.0	N	N	N
CAPE DECISION	107	49.5	Y	Y	Y
CAPE HENRY	75	89.3	Y	Y	Y
CAPE MAY	93	100.0	N	N	N
CAPE MOHICAN	83	100.0	Y	Y	N
CAPE WASHINGTON	78	8.9	Y	N	N
CAPE WRATH	169	8.2	Y	N	N
CARDIGAN BAY	200	100.0	N	N	N

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED JAN	FEB	MAR
CARLA A. HILLS	76	90.7	Y	Y	Y
CAROLINE OLDENDORFF	6	100.0	Y	N	N
CASON J. CALLAWAY	6	66.6	N	N	Y
CELEBRATION	31	100.0	Y	Y	N
CENTURY	21	42.8	N	N	Y
CENTURY HIGHWAY #2	57	100.0	N	N	N
CENTURY HIGHWAY NO. 1	55	100.0	N	N	N
CENTURY HIGHWAY_NO. 3	66	100.0	N	N	N
CENTURY LEADER NO. 1	87	100.0	N	N	N
CGM PROVENCE	14	100.0	N	N	N
CHARLES ISLAND	34	100.0	N	N	N
CHARLES LYKES	182	100.0	N	N	N
CHARLES M. BEEGHLEY	22	95.4	Y	N	Y
CHARLES PIGOTT	129	0.0	Y	Y	Y
CHARLESTON	2	100.0	N	N	N
CHASTINE MAERSK	159	94.9	Y	Y	Y
CHEMICAL PIONEER	51	66.6	Y	N	N
CHESAPEAKE TRADER	169	49.1	N	N	Y
CHEVRON ARIZONA	1	100.0	N	N	N
CHEVRON COLORADO	87	83.9	Y	Y	Y
CHEVRON EDINBURGH	218	67.8	Y	Y	Y
CHEVRON EMPLOYEE PRIDE	90	1.1	Y	N	Y
CHEVRON MARINER	57	0.0	Y	N	Y
CHEVRON MISSISSIPPI	164	96.3	Y	Y	Y
CHEVRON NAGASAKI	79	0.0	N	Y	N
CHEVRON OREGON	1	100.0	N	N	N
CHEVRON PERTH	10	100.0	N	N	N
CHEVRON SOUTH AMERICA	147	87.0	Y	Y	Y
CHEVRON WASHINGTON	1	100.0	N	N	N
CHIEF GADAO	79	72.1	N	Y	Y
CHILEAN EXPRESS	12	100.0	N	N	N
CHINA HOPE	32	100.0	N	N	N
CHIQUITA BARU	146	100.0	N	N	N
CHIQUITA BELGIE	113	100.0	N	N	N
CHIQUITA BREMEN	114	100.0	N	N	N
CHIQUITA BRENDA	201	100.0	N	N	N
CHIQUITA DEUTSCHLAND	164	100.0	N	N	N
CHIQUITA FRANCES	103	100.0	N	N	N
CHIQUITA ITALIA	90	100.0	N	N	N
CHIQUITA JEAN	153	100.0	N	N	N
CHIQUITA JOY	175	100.0	N	N	N
CHIQUITA NEDERLAND	22	100.0	N	N	N
CHIQUITA SCANDINAVIA	147	100.0	N	N	N
CHIQUITA SCHWEIZ	146	100.0	N	N	N
CHOYANG PRIDE	18	100.0	N	N	N
CHOYANG VISION	125	44.0	Y	Y	Y
CHRISTIANE	124	100.0	N	N	N
CITY OF DURBAN	173	100.0	N	N	N
CLEVELAND	3	100.0	N	N	N
CLIFFORD MAERSK	38	100.0	N	N	N
CMS ISLAND EXPRESS	20	0.0	Y	Y	Y
COAST RANGE	56	85.7	Y	Y	N
COASTAL EAGLE POINT	1	100.0	N	N	N
COLUMBIA BAY	46	100.0	N	N	N
COLUMBIA STAR	231	100.0	N	N	N
COLUMBINE	88	96.5	N	N	Y
COLUMBUS AMERICA	235	100.0	N	N	N
COLUMBUS AUSTRALIA	6	100.0	N	N	N
COLUMBUS CANADA	197	100.0	N	N	N
COLUMBUS NEW ZEALAND	84	100.0	N	N	N
COLUMBUS QUEENSLAND	12	100.0	N	N	N
COLUMBUS VICTORIA	105	100.0	N	N	N
CONDOLEEZZA RICE	101	0.9	N	Y	Y
CONTIENTAL WING	105	100.0	N	N	N
CONTSHIP AMERICA	39	100.0	N	N	N
CONTSHIP HOUSTON	101	88.1	N	Y	Y
COPACABANA	45	100.0	N	N	Y
CORAL HIGHWAY	9	100.0	N	N	N
CORDELIA	259	4.6	Y	Y	N
CORMORANT ARROW	73	36.9	N	Y	N
CORNELIA MAERSK	162	90.7	Y	Y	Y
CORNUCOPIA	48	60.4	Y	Y	Y
CORONADO	2	0.0	N	Y	N
CORPUS CHRISTI	35	100.0	N	N	N
CORWITH CRAMER	147	67.3	Y	Y	Y
COSMOWAY	32	96.8	Y	Y	Y
COURAGEOUS	34	0.0	Y	Y	Y
COURIER	24	100.0	N	N	N
COURTNEY BURTON	6	100.0	Y	N	N
COURTNEY L	3	100.0	N	N	N
CRISTOFORO COLOMBO	44	25.0	N	Y	Y
CROATIA EXPRESS	13	100.0	N	N	N
CROWN OF SCANDINAVIA	218	100.0	N	N	N
CROWN PRINCESS	52	100.0	N	N	N
CRYSTAL HARMONY	2	100.0	N	N	N
CSK UNITY	65	98.4	Y	Y	Y
CSL ATLAS	34	100.0	N	N	N
CSL CABO	138	93.4	Y	N	N
DAGMAR MAERSK	128	100.0	N	N	N
DAISHIN MARU	79	88.6	Y	Y	N
DEL MONTE CONSUMER	39	10.2	Y	Y	N
DEL MONTE PACKER	1	0.0	Y	N	N
DEL MONTE TRADER	88	51.1	Y	Y	N
DELAWARE TRADER	367	76.8	Y	Y	Y
DENALI	166	79.5	Y	N	N
DEPPE FLORIDA	18	100.0	N	N	N
DESTINY	173	78.6	Y	Y	Y
DG COLUMBIA	248	67.3	Y	Y	Y
DIAMOND STAR	14	100.0	N	N	N
DIRCH MAERSK	98	57.1	Y	Y	Y
DIRECT EAGLE	135	100.0	N	N	N
DIRECT FALCON	144	100.0	Y	Y	Y
DIRECT KEA	189	100.0	N	N	N
DIRECT KIWI	181	81.2	Y	Y	Y
DIRECT KOOKABURRA	143	53.1	Y	Y	Y
DOCK EXPRESS 20	43	100.0	N	N	N
DOCTOR LYKES	134	59.7	Y	Y	Y
DORTHE MAERSK	13	100.0	N	N	N
DORTHE OLDENDORFF	99	88.8	Y	Y	Y
DOUBLE GLORY	6	100.0	N	N	N
DRYSO	13	100.0	N	N	N
DUBROVNIK EXPRESS	12	100.0	N	N	N
DUCHESS	51	86.2	Y	N	Y
DUHALLOW	210	100.0	N	N	N
DUNCAN ISLAND	198	90.4	Y	Y	Y
DUSSELDORF EXPRESS	745	100.0	N	N	N
E.P. LE QUEBECOIS	4	100.0	N	N	N
EAGLE ANAHUAC	66	100.0	N	N	N
ECSTASY	144	38.1	Y	N	N
EDELWIESS	32	100.0	N	N	N
EDGAR B. SPEER	35	51.4	Y	N	Y
EDWIN H. GOTT	90	57.7	Y	N	Y
EDYTH L	79	96.2	Y	Y	Y
ELISE SHULTE	97	0.0	Y	Y	Y
ELLEN KNUDSEN	7	14.2	Y	N	N
ELLENSBORG	62	0.0	Y	Y	N
ELLIOTT BAY	210	96.1	Y	Y	Y
ELSBERG	91	0.0	Y	Y	Y
ENERGY ENTERPRISE	63	52.3	Y	Y	Y
ENGLISH STAR	166	100.0	N	N	N
ENIF	89	100.0	N	N	N
EQUATORIAL LION	192	100.0	N	N	N

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED JAN	FEB	MAR
EVER GAINING	31	100.0	N	N	N
EVER GALLANT	5	100.0	N	N	N
EVER GARLAND	5	100.0	N	N	N
EVER GENERAL	9	100.0	N	N	N
EVER GENIUS	13	100.0	N	N	N
EVER GIVEN	10	100.0	N	N	N
EVER GLEAMY	11	45.4	Y	Y	N
EVER GLORY	6	100.0	N	N	N
EVER GOLDEN	25	100.0	N	N	N
EVER GRADE	13	100.0	N	N	N
EVER GROUP	7	100.0	N	N	N
EVER GROWTH	12	100.0	N	N	N
EVER GUARD	6	100.0	N	N	N
EVER REACH	7	100.0	N	N	N
EVER REPUTE	31	100.0	Y	Y	Y
EVER RESULT	22	100.0	N	N	N
EVER REWARD	4	100.0	N	N	N
EVER RIGHT	30	70.0	Y	N	N
EVER ROUND	20	100.0	N	N	N
EWL VENEZUELA	562	100.0	N	N	N
EXCELSIOR	180	100.0	N	N	N
EXPORT FREEDOM	185	29.7	Y	Y	Y
EXPORT PATRIOT	121	30.5	Y	Y	Y
FAIRLIFT	129	100.0	N	N	N
FALSTRIA	19	100.0	N	N	N
FANAL TRADER	27	100.0	N	Y	Y
FANTASY	57	89.4	N	Y	Y
FARALLON ISLAND	497	100.0	N	N	N
FASCINATION	36	66.6	Y	Y	Y
FAUST	124	84.6	Y	N	Y
FETISH	30	0.0	N	Y	N
FIDELIO	185	69.7	Y	Y	N
FIGARO	21	100.0	N	N	N
FIR GROVE	16	100.0	N	N	N
FLAMENGO	89	0.0	N	Y	N
FOREST CHAMPION	56	96.4	N	Y	Y
FOREST TRADER	136	100.0	N	N	N,
FRANCES HAMMER	65	100.0	N	N	N
FRANCES L	173	100.0	N	N	N
FRANCESCO	125	47.2	Y	Y	Y
FRANKFURT EXPRESS	44	100.0	N	N	N
FRONT LEADER	57	100.0	N	N	N
GALAXY ACE	15	100.0	N	N	N
GALVESTON BAY	142	85.9	Y	Y	Y
GENEVIEVE LYKES	133	49.6	Y	Y	Y
GEORGE H. WEYERHAEUSER	213	70.4	Y	Y	Y
GEORGE SCHULTZ	61	67.2	N	N	Y
GEORGE WASHINGTON BRID	182	92.3	Y	Y	Y
GEORGIA RAINBOW II	165	61.2	Y	Y	Y
GERMAN SENATOR	17	100.0	N	N	N
GERONIMO	1	100.0	N	N	N
GLOBAL LINK	74	100.0	N	N	N
GLOBAL MARINER	34	100.0	N	N	Y
GLOBAL NEXTAGE	81	100.0	N	N	N
GLORIOUS SUCCESS	51	58.8	Y	Y	Y
GLORIOUS SUN	124	87.0	Y	Y	Y
GOLDEN APO	19	100.0	N	N	N
GOLDEN GATE	11	100.0	N	Y	Y
GOLDEN GATE BRIDGE	189	98.4	Y	Y	Y
GREAT LAND	263	64.6	Y	Y	Y
GREEN BAY	218	23.3	Y	N	Y
GREEN ISLAND	139	18.7	Y	Y	Y
GREEN LAKE	176	52.2	Y	Y	Y
GREEN MAYA	35	100.0	N	N	N
GREEN RAINIER	69	28.9	Y	N	N
GREEN RIDGE	50	100.0	N	Y	Y
GREEN SASEBO	35	31.4	N	N	Y
GRETKE OLDENDORFF	165	84.8	Y	Y	Y
GROTON	108	82.4	Y	Y	Y
GROWTH RING	234	100.0	N	N	N
GUANAJUATO	188	25.5	Y	N	N
GUAYAMA	152	65.1	Y	N	Y
GULF CURRENT	227	68.2	Y	Y	N
GULF SPIRIT	22	100.0	N	N	N
GULL ARROW	20	100.0	N	N	N
GYN YOH	53	90.5	Y	Y	Y
GYPSUM BARON	104	100.0	N	N	N
GYPSUM KING	79	100.0	N	N	N
HANDY ISLANDER	37	94.5	Y	Y	Y
HANJIN BARCELONA	49	51.0	Y	Y	N
HANJIN BREMEN	12	100.0	N	N	N
HANJIN COLOMBO	40	100.0	N	N	N
HANJIN ELIZABETH	13	100.0	N	N	N
HANJIN FELIXSTOWE	15	100.0	N	N	N
HANJIN KAOHSIUNG	8	100.0	N	N	N
HANJIN LE HAVRE	38	100.0	N	N	N
HANJIN MARSEILLES	56	51.7	Y	Y	Y
HANJIN OAKLAND	12	100.0	N	N	N
HANJIN PORTLAND	30	100.0	Y	Y	Y
HANJIN ROTTERDAM	16	100.0	N	N	N
HANJIN SHANGHAI	34	100.0	N	N	N
HANJIN TOKYO	13	100.0	N	N	N
HANJIN VANCOUVER	18	100.0	N	N	N
HANSA CARRIER	111	91.8	Y	Y	Y
HARBOUR BRIDGE	82	56.0	Y	Y	Y
HAVELLAND	74	100.0	N	N	N
HEICON	71	100.0	N	N	N
HEIDELBERG EXPRESS	733	100.0	N	N	N
HELVETIA	121	91.7	Y	N	N
HENRY HUDSON BRIDGE	222	100.0	N	N	N
HERBERT C. JACKSON	6	33.3	N	N	Y
HESIOD	83	100.0	N	N	N
HOEGH DRAKE	62	58.0	N	Y	Y
HOEGH DYKE	48	72.9	Y	N	N
HOEGH MERIT	179	52.5	Y	Y	Y
HOEGH MINERVA	24	100.0	N	N	N
HONSHU SILVIA	43	79.0	N	Y	Y
HOOD ISLAND	112	58.9	Y	N	N
HOUSTON	159	100.0	N	N	N
HOUSTON EXPRESS	180	100.0	N	N	N
HUAL CARMENCITA	52	100.0	N	N	N
HUAL INGRITA	17	82.3	N	N	Y
HUAL ROLITA	45	60.0	Y	N	N
HUMACAO	38	68.4	Y	N	Y
HUMBERGRACHT	141	100.0	N	N	N
HUME HIGHWAY	35	100.0	N	N	N
HYUNDAI DYNASTY	493	100.0	N	N	N
HYUNDAI FIDELITY	37	100.0	N	N	Y
HYUNDAI FORTUNE	10	80.0	Y	Y	N
HYUNDAI FREEDOM	116	38.7	Y	Y	N
HYUNDAI INDEPENDENCE	4	100.0	N	N	Y
HYUNDAI LIBERTY	16	100.0	N	N	N
ICE FERN	58	100.0	N	N	N
IGARKA	22	100.0	N	N	N
IMAGINATION	55	90.9	Y	Y	Y
INDIAN OCEAN	146	98.6	Y	Y	Y
INDIANA HARBOR	14	50.0	N	N	Y
INSPIRATION	149	69.7	Y	Y	Y
IOWA TRADER	50	92.0	N	N	Y
ISLA DE CEDROS	18	100.0	N	N	N
ISLAND BREEZE	2	100.0	N	N	N
ISLAND PRINCESS	4	100.0	N	N	N

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED JAN	FEB	MAR
ITB BALTIMORE	22	77.2	N	Y	Y
ITB MOBILE	60	96.6	Y	Y	Y
ITB NEW YORK	113	12.3	Y	Y	Y
IVER EXPLORER	63	100.0	N	N	N
IVER EXPRESS	14	100.0	N	N	N
IVYBANK	46	100.0	N	N	N
IWANUMA MARU	273	24.9	Y	Y	Y
J. DENNIS BONNEY	137	27.7	Y	Y	Y
JACKLYN M.	3	0.0	N	N	Y
JACKSONVILLE	165	87.2	Y	Y	Y
JADE ORIENT	44	100.0	N	N	N
JADE PACIFIC	39	100.0	N	N	N
JAHRE SPIRIT	61	100.0	N	N	N
JALAGOVIND	2	100.0	N	N	N
JAMES	43	100.0	N	N	N
JAMES N. SULLIVAN	47	80.8	N	N	Y
JAMES R. BARKER	11	54.5	Y	N	Y
JAPAN RAINBOW 2	56	73.2	Y	N	N
JAPAN SENATOR	85	100.0	N	N	N
JASMINE	67	100.0	N	N	N
JEAN LYKES	122	41.8	Y	Y	Y
JEB STUART	116	1.7	N	N	Y
JEBEL ALI	63	53.9	Y	N	N
JO ELM	114	100.0	N	N	N
JOHN G. MUNSON	14	100.0	N	N	Y
JOIDES RESOLUTION	388	94.0	Y	Y	Y
JOSEPH L. BLOCK	6	100.0	N	N	Y
JOSEPH LYKES	17	100.0	N	N	N
JUBILANT	29	20.6	Y	N	N
JUBILEE	25	76.0	Y	N	N
JUPITER DIAMOND	8	100.0	N	N	N
KAIJIN	94	100.0	N	N	N
KANSAS TRADER	130	100.0	N	N	N
KAPITAN BYANKIN	124	69.3	Y	Y	Y
KAPITAN GNEZPILOV	16	100.0	N	N	N
KAPITAN KONEV	124	87.0	Y	Y	Y
KAPITAN MAN	40	100.0	N	N	N
KAPITAN SERYKH	87	95.4	N	Y	Y
KAREN ANDRIE	1	100.0	N	N	N
KAUAI	187	92.5	Y	Y	Y
KAYE E. BARKER	33	45.4	Y	N	Y
KAZIMAH	185	100.0	N	N	N
KEE LUNG	28	100.0	N	N	N
KEN SHIN	56	87.5	N	Y	Y
KEN SHO	10	100.0	N	N	N
KENAI	15	100.0	N	Y	Y
KENNETH E. HILL	140	98.5	Y	Y	Y
KENNETH T. DERR	168	63.6	Y	Y	Y
KENTUCKY HIGHWAY	19	100.0	N	N	N
KNOCK ALLAN	57	100.0	N	N	N
KNORR	86	60.4	Y	N	N
KOELN EXPRESS	363	100.0	N	N	N
KOMET	97	42.2	Y	Y	Y
KURAMA	17	100.0	N	N	N
KURE	78	97.4	Y	N	Y
LA TRINITY	52	96.1	Y	Y	Y
LAKE CHARLES	1	100.0	N	N	N
LEE A. TREGURTHA	37	51.3	Y	N	Y
LEGEND OF THE SEAS	79	65.8	Y	Y	Y
LEON	49	100.0	N	N	N
LEONARD J. COWLEY	1	100.0	N	N	N
LEONIA	156	100.0	N	N	N
LIBERTY STAR	39	100.0	N	N	N
LIBERTY SUN	94	53.1	Y	Y	Y
LIBERTY VICTORY	65	87.6	Y	Y	Y
LIBERTY WAVE	19	68.4	Y	Y	N
LIHUE	130	21.5	Y	Y	Y
LILAC ACE	24	100.0	N	N	N
LINDA OLDENDORF	189	38.6	Y	Y	N
LIRCAY	149	67.7	Y	Y	Y
LNG AQUARIUS	157	12.1	Y	Y	Y
LNG CAPRICORN	31	100.0	Y	N	N
LNG LEO	135	51.1	Y	Y	Y
LNG LIBRA	54	9.2	Y	Y	N
LNG TAURUS	91	17.5	Y	Y	Y
LNG VIRGO	93	26.8	Y	Y	Y
LONDON ENTERPRISE	12	100.0	N	N	N
LONDON SPIRIT	152	100.0	N	N	N
LONDON VICTORY	52	100.0	N	N	N
LONG BEACH	160	38.7	Y	Y	Y
LONG LINES	50	80.0	Y	Y	Y
LOOTSGRACHT	117	100.0	N	N	N
LT ARGOSY	6	100.0	N	N	N
LT PRAGATI	9	100.0	N	N	N
LT. ODYSSEY	33	100.0	N	N	N
LTC CALVIN P. TITUS	29	27.5	Y	Y	N
LUCKY	41	100.0	N	N	N
LUCKY BULKER	38	100.0	N	N	N
LUCKY GRACE	157	14.6	Y	Y	Y
LUCY OLDENDORFF	86	70.9	Y	N	N
LURLINE	83	100.0	Y	Y	Y
LUTJENBURG	175	100.0	N	N	N
MAASDAM	27	100.0	N	N	N
MACKINAC BRIDGE	174	98.8	Y	Y	N
MADISON MAERSK	50	60.0	Y	Y	N
MAERSK CONSTELLATION	14	100.0	N	N	N
MAERSK ENDEAVOUR	674	100.0	N	N	N
MAERSK EXPLORER	475	100.0	N	N	N
MAERSK GANNET	169	100.0	N	N	N
MAERSK GIANT	590	100.0	N	N	N
MAERSK SAO PAOLO	26	100.0	N	N	N
MAERSK SHETLAND	39	100.0	N	N	N
MAERSK SOMERSET	249	100.0	N	N	N
MAERSK STAFFORD	90	100.0	N	N	N
MAERSK SUN	275	77.0	Y	Y	Y
MAERSK TANJONG	29	100.0	N	N	N
MAGLEBY MAERSK	102	54.9	Y	Y	Y
MAHARASHTRA	88	76.1	Y	Y	Y
MAHIMAHI	189	78.3	Y	Y	Y
MAIRANGI BAY	185	100.0	N	N	N
MAJ STEPHEN W PLESS MP	168	23.8	Y	Y	Y
MAJESTIC MAERSK	113	92.9	Y	Y	Y
MANGAL DESAI	19	100.0	N	N	N
MANHATTAN BRIDGE	104	59.6	Y	Y	Y
MANOA	250	60.8	Y	Y	Y
MANUKAI	188	51.0	Y	Y	Y
MANULANI	163	49.0	Y	Y	Y
MARCHEN MAERSK	110	60.9	Y	Y	Y
MAREN MAERSK	84	44.0	Y	N	Y
MARGARET LYKES	15	100.0	Y	N	N
MARIA LAURA	9	100.0	N	N	N
MARIE MAERSK	132	70.4	Y	Y	Y
MARINE RELIANCE	78	100.0	N	N	N
MARIT MAERSK	97	56.7	Y	Y	Y
MARK HANNAH	6	100.0	Y	N	Y
MARLIN	116	0.0	Y	Y	N
MATHILDE MAERSK	118	66.9	Y	Y	Y
MATSONIA	150	17.3	Y	Y	N
MAUI	210	70.9	Y	Y	Y
MAURICE EWING	220	0.0	Y	N	N
MAYAGUEZ	176	54.5	N	Y	Y
MAYVIEW MAERSK	112	50.8	Y	Y	Y

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED JAN	FEB	MAR
MC-KINNEY MAERSK	121	58.6	Y	Y	Y
MEDALLION	154	95.4	Y	N	N
MEDUSA CHALLENGER	78	60.2	Y	N	Y
MELBOURNE STAR	227	100.0	N	N	N
MELVILLE	132	81.0	Y	N	N
MERCHANT PREMIER	103	100.0	N	N	N
MERIDA	5	0.0	N	N	Y
MERIDIAN	48	0.0	Y	Y	Y
MERLION ACE	127	35.4	Y	Y	Y
MESABI MINER	17	100.0	N	N	N
METEOR	641	100.0	N	N	N
METTE MAERSK	88	69.3	Y	Y	Y
MICHIGAN	221	49.3	Y	Y	Y
MILDBURG	199	100.0	N	N	N
MING ASIA	17	100.0	N	N	N
MING PLEASURE	141	100.0	N	N	N
MING PROPITIOUS	3	100.0	N	N	N
MITLA	13	100.0	N	N	N
MOKIHANA	189	80.9	Y	Y	Y
MORELOS	237	94.5	Y	N	N
MORMACSKY	4	100.0	Y	N	N
MORMACSTAR	93	4.3	Y	Y	Y
MORMACSUN	61	62.2	Y	N	N
MOSEL ORE	209	85.6	Y	Y	N
MSC JESSICA	159	32.7	Y	Y	Y
MUNKEBO MAERSK	57	84.2	Y	N	N
NATIONAL DIGNITY	30	93.3	Y	Y	Y
NATIONAL HONOR	33	45.4	Y	N	Y
NATIONAL PRIDE	46	95.6	Y	Y	Y
NEDLLOYD ABIDJAN	150	100.0	Y	Y	Y
NEDLLOYD DELFT	158	100.0	N	N	N
NEDLLOYD HOLLAND	277	59.2	Y	Y	Y
NEDLLOYD MONTEVIDEO	137	100.0	N	N	N
NEDLLOYD RALEIGH BAY	68	100.0	N	N	N
NEDLLOYD VAN CLOON	54	100.0	N	N	N
NEDLLOYD VAN DAJIMA	160	100.0	N	N	N
NEDLLOYD VAN DIEMEN	143	100.0	N	N	N
NEGO LOMBOK	158	90.5	Y	N	Y
NELVANA	81	88.8	Y	Y	Y
NEPTUNE ACE	67	100.0	N	N	N
NEPTUNE JADE	41	100.0	N	N	N
NEPTUNE RHODONITE	15	100.0	N	N	N
NESLIHAN	3	100.0	N	N	N
NEW HORIZON	116	56.8	Y	Y	Y
NEW NIKKI	154	95.4	Y	Y	Y
NEW YORK SENATOR	21	100.0	N	N	N
NEW YORK SUN	79	88.6	Y	Y	Y
NEWARK BAY	249	82.3	Y	Y	Y
NEWPORT BRIDGE	61	100.0	N	N	N
NOAA DAVID STARR JORDA	121	75.2	Y	Y	Y
NOAA SHIP ALBATROSS IV	15	100.0	N	N	N
NOAA SHIP CHAPMAN	80	93.7	N	N	Y
NOAA SHIP DELAWARE II	374	84.2	Y	Y	Y
NOAA SHIP FERREL	131	89.3	N	Y	Y
NOAA SHIP KA'IMIMOANA	425	82.3	Y	Y	Y
NOAA SHIP MCARTHUR	174	61.4	N	Y	Y
NOAA SHIP MILLER FREEM	245	9.7	N	Y	Y
NOAA SHIP OREGON II	232	74.5	Y	Y	N
NOAA SHIP RAINIER	39	2.5	N	N	Y
NOAA SHIP T. CROMWELL	172	100.0	Y	N	Y
NOAA SHIP WHITING	314	96.1	N	N	Y
NOBEL STAR	39	100.0	N	N	N
NOBLEZA	79	7.5	Y	Y	N
NOL AMBER	8	100.0	N	N	N
NOL DELPHI	180	100.0	N	N	N
NOL DIAMOND	6	100.0	N	N	N
NOL LAGENO	85	100.0	N	N	N
NOL RISSO	156	100.0	N	N	N
NOL RUBY	53	100.0	N	N	N
NOL STENO	246	100.0	N	N	N
NOL TOPAZ	21	100.0	N	N	N
NOL ZIRCON	42	100.0	N	N	N
NOLIZWE	117	100.0	N	N	N
NOMZI	350	94.8	Y	Y	Y
NORD JAHRE TARGET	2	100.0	N	N	N
NORD JAHRE TRANSPORTER	4	100.0	N	N	N
NORD PARTNER	119	92.4	Y	Y	Y
NORDMAX	174	100.0	N	N	N
NORTHERN LIGHTS	206	61.6	Y	Y	Y
NTABENI	198	100.0	N	N	N
NUERNBERG EXPRESS	749	100.0	N	N	N
NUEVO LEON	28	100.0	N	N	N
NUEVO SAN JUAN	108	89.8	Y	Y	Y
NYK SEABREEZE	93	100.0	N	N	N
NYK SPRINGTIDE	30	100.0	N	N	N
NYK SUNRISE	31	100.0	N	N	N
NYK SURFWIND	58	100.0	N	N	N
OBO ENGIN	46	100.0	Y	Y	Y
OCEAN BELUGA	61	100.0	N	N	N
OCEAN CAMELLIA	148	91.8	Y	Y	Y
OCEAN CITY	35	100.0	N	N	N
OCEAN HARMONY	98	98.9	Y	Y	Y
OCEAN LAUREL	42	78.5	Y	Y	Y
OCEAN ORCHID	46	95.6	Y	Y	Y
OCEAN PEARL	28	60.7	N	Y	Y
OCEAN SERENE	90	92.2	N	N	Y
OJI PIONEER	43	32.5	Y	N	N
OLEANDER	184	85.3	Y	Y	Y
OLIVEBANK	98	100.0	N	N	N
OMI COLUMBIA	67	52.2	Y	Y	Y
OOCL AMERICA	134	94.7	Y	Y	Y
OOCL CALIFORNIA	57	100.0	N	N	N
OOCL CHINA	126	92.0	Y	Y	Y
OOCL ENVOY	14	100.0	N	N	N
OOCL FAIR	82	100.0	N	N	N
OOCL FAME	67	100.0	Y	Y	Y
OOCL FIDELITY	155	100.0	N	N	N
OOCL FORTUNE	110	100.0	N	N	N
OOCL FREEDOM	123	100.0	N	N	N
OOCL FRONTIER	84	86.9	Y	Y	N
OOCL HONG KONG	78	83.3	Y	Y	Y
OOCL INNOVATION	174	56.8	Y	Y	N
OOCL INSPIRATION	158	100.0	N	N	N
OOCL JAPAN	195	100.0	N	N	N
ORANGE WAVE	125	17.6	Y	Y	Y
OREGON RAINBOW III	74	0.0	Y	N	N
ORIENTE GRACE	40	100.0	N	N	N
ORIENTE HOPE	139	55.3	Y	Y	Y
ORIENTE NOBLE	70	42.8	Y	Y	Y
ORIENTE PRIME	58	79.3	Y	Y	Y
ORION HIGHWAY	85	69.4	Y	N	N
OURO DO BRASIL	24	91.6	Y	Y	Y
OVERSEAS ALASKA	31	51.6	Y	Y	Y
OVERSEAS ARCTIC	28	60.7	N	N	Y
OVERSEAS BOSTON	1	100.0	N	N	N
OVERSEAS CHICAGO	43	100.0	N	N	N
OVERSEAS HARRIET	43	53.4	N	N	Y
OVERSEAS JOYCE	103	79.6	Y	Y	Y
OVERSEAS JUNEAU	142	0.0	Y	Y	Y
OVERSEAS MARILYN	150	33.3	Y	Y	N
OVERSEAS NEW ORLEANS	31	100.0	N	N	N
OVERSEAS NEW YORK	3	100.0	N	N	N

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED JAN	FEB	MAR
OVERSEAS OHIO	57	29.8	N	Y	Y
OVERSEAS WASHINGTON	54	55.5	N	N	Y
PACASIA	184	33.6	Y	Y	Y
PACDUKE	74	100.0	N	N	N
PACIFIC HIRO	88	80.6	Y	Y	N
PACIFIC HOPE	69	7.2	N	Y	Y
PACIFIC PRINCESS	23	100.0	N	N	N
PACIFIC RAINBOW II	115	61.7	N	Y	Y
PACIFIC WAVE	35	100.0	N	N	N
PACMERCHANT	24	100.0	N	N	N
PACPRINCE	3	100.0	N	N	N
PACQUEEN	43	100.0	N	N	N
PACROSE	32	100.0	N	N	N
PACSEA	62	93.5	Y	N	N
PARIS	50	100.0	N	N	N
PATRIOT	37	13.5	N	N	Y
PATRIOT STATE	38	100.0	N	N	N
PAUL BUCK	22	18.1	N	N	Y
PAUL R. TREGURTHA	31	70.9	Y	N	N
PEARL REEFER	140	7.8	Y	N	N
PEGGY DOW	132	100.0	N	N	N
PFC DEWAYNE T. WILLIAM	112	0.0	Y	Y	Y
PFC EUGENE A. OBREGON	79	22.7	Y	Y	Y
PFC JAMES ANDERSON JR	4	100.0	N	N	N
PFC WILLIAM B. BAUGH	48	6.2	Y	Y	Y
PHAROS	29	100.0	N	N	N
PHILADELPHIA	134	68.6	Y	Y	Y
PHILIP R. CLARKE	7	85.7	N	N	Y
PHOENIX DIAMOND	44	97.7	Y	Y	Y
PINO GLORIA	32	100.0	N	N	N
PISCES PIONEER	91	100.0	N	N	N
POLAR EAGLE	147	31.9	Y	Y	Y
POLYNESIA	259	64.8	Y	Y	Y
POTOMAC TRADER	118	78.8	Y	Y	N
POYANG	142	100.0	N	N	N
PRESIDENT ADAMS	124	84.6	Y	Y	Y
PRESIDENT EISENHOWER	185	45.4	Y	Y	Y
PRESIDENT F. ROOSEVELT	121	59.5	Y	Y	Y
PRESIDENT JACKSON	146	68.4	Y	Y	Y
PRESIDENT KENNEDY	134	75.3	Y	N	Y
PRESIDENT POLK	241	75.9	Y	Y	Y
PRESIDENT TRUMAN	145	62.7	Y	Y	Y
PRESQUE ISLE	27	48.1	Y	N	N
PRINCE OF OCEAN	1	100.0	N	N	N
PRINCE OF TOKYO 2	188	71.8	Y	Y	Y
PRINCE WILLIAM SOUND	124	47.5	Y	Y	Y
PRINCESS OF SCANDINAVI	336	100.0	N	N	N
PROJECT ORIENT	167	100.0	N	N	N
PUERTO CORTES	16	100.0	N	N	N
PVT FRANKLIN J. PHILLI	21	28.5	Y	N	N
PYTCHLEY	192	100.0	N	N	N
QUEEN ELIZABETH 2	72	100.0	N	N	N
QUEEN OF SCANDINAVIA	234	100.0	N	N	N
QUEENSLAND STAR	213	100.0	N	N	N
R.J. PFEIFFER	109	45.8	Y	Y	Y
RANI PADMINI	10	100.0	N	N	N
RAYMOND E. GALVIN	50	96.0	Y	Y	Y
REGAL PRINCESS	65	67.6	N	Y	N
REGINA J	24	100.0	N	N	N
REPULSE BAY	140	100.0	N	N	N
RESERVE	9	55.5	N	N	Y
RESOLUTE	145	36.5	Y	Y	Y
RHINE FOREST	161	46.5	Y	Y	Y
RICHARD G MATTHIESEN	6	0.0	Y	N	N
RICHARD REISS	1	0.0	N	N	Y
ROBERT E. LEE	113	25.6	N	Y	Y
ROGER BLOUGH	53	77.3	Y	N	Y
ROGER REVELLE	299	90.9	Y	Y	Y
ROSINA TOPIC	16	100.0	N	N	N
ROSITA	174	23.5	Y	Y	Y
ROSSEL CURRENT	22	100.0	N	N	N
ROVER	17	100.0	N	N	N
ROYAL MAJESTY	18	100.0	N	N	Y
ROYAL PRINCESS	25	100.0	N	N	N
RUBIN BONANZA	41	100.0	N	Y	Y
RUBIN KOBE	177	100.0	N	N	N
RUBIN PEARL	61	37.7	Y	Y	Y
RUBIN ROSE	111	49.5	N	Y	Y
RUBIN STAR	49	59.1	Y	Y	Y
RUBIN STELLA	174	51.7	Y	Y	Y
RYNDAM	81	100.0	N	N	N
S.T. CRAPO	16	68.7	Y	N	Y
SAGA CREST	27	100.0	N	N	N
SALINAS	23	100.0	N	N	N
SALOME	137	50.3	Y	Y	N
SAM HOUSTON	6	100.0	N	N	N
SAMUEL H. ARMACOST	67	49.2	N	N	Y
SAMUEL L. COBB	30	100.0	N	N	Y
SAMUEL RISLEY	394	100.0	N	N	N
SAN ANTONIO	116	98.2	Y	Y	N
SAN FELIPE	9	100.0	N	N	N
SAN FERNANDO	33	100.0	N	N	N
SAN FRANCISCO	91	100.0	N	N	N
SAN ISIDRO	14	100.0	N	N	N
SAN MARCOS	181	4.4	Y	N	N
SAN VINCENTE	91	100.0	N	N	N
SANKO LAUREL	10	100.0	N	N	Y
SANKO MOON	45	100.0	N	N	N
SANTA CHRISTINA	176	90.9	Y	Y	Y
SANTORIN 2	375	66.1	Y	Y	Y
SARAJEVO EXPRESS	35	100.0	N	N	N
SARAMATI	79	100.0	N	N	N
SAUDI ABHA	23	100.0	N	N	N
SAUDI DIRIYAH	17	100.0	N	N	N
SC HORIZON	168	86.3	Y	Y	N
SCHACKENBORG	43	100.0	N	N	N
SEA COMMERCE	119	79.8	Y	Y	Y
SEA FLORIDA	171	78.3	Y	Y	Y
SEA FOX	241	100.0	N	N	N
SEA INITIATIVE	30	100.0	N	N	N
SEA ISLE CITY	7	71.4	Y	N	N
SEA JUSTICE	173	91.9	Y	Y	Y
SEA LION	194	82.9	Y	Y	Y
SEA MARINER	98	86.7	Y	N	N
SEA MERCHANT	430	91.3	Y	Y	Y
SEA NOVIA	18	94.4	N	N	Y
SEA PRINCESS	32	81.2	N	Y	N
SEA RACER	39	100.0	N	N	N
SEA TRADE	141	100.0	Y	N	N
SEA WISDOM	167	86.8	N	Y	Y
SEA WOLF	217	88.0	Y	Y	Y
SEA/LAND VICTORY	172	100.0	N	N	N
SEABOARD SUN	17	0.0	Y	N	N
SEABOARD UNIVERSE	74	77.0	Y	Y	Y
SEABREEZE I	39	92.3	Y	Y	Y
SEACHAMPION	157	92.9	Y	Y	N
SEALAND ANCHORAGE	110	59.0	Y	Y	Y
SEALAND ATLANTIC	181	57.4	N	N	Y
SEALAND CHALLENGER	96	62.5	Y	Y	Y
SEALAND CHAMPION	133	84.9	Y	Y	Y
SEALAND COMET	122	81.1	Y	Y	Y
SEALAND CONSUMER	269	97.7	Y	Y	Y

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED JAN	FEB	MAR
SEALAND CRUSADER	268	88.4	Y	Y	Y
SEALAND DEFENDER	237	83.5	Y	Y	Y
SEALAND DEVELOPER	109	39.4	Y	Y	Y
SEALAND DISCOVERY	192	33.8	Y	Y	Y
SEALAND ENDURANCE	130	34.6	Y	Y	Y
SEALAND ENTERPRISE	309	75.4	Y	Y	Y
SEALAND EXPEDITION	79	100.0	Y	Y	Y
SEALAND EXPLORER	145	93.7	Y	Y	Y
SEALAND EXPRESS	120	80.0	Y	Y	Y
SEALAND FREEDOM	80	100.0	Y	Y	Y
SEALAND HAWAII	757	99.3	Y	Y	Y
SEALAND INDEPENDENCE	147	35.3	Y	Y	Y
SEALAND INNOVATOR	135	94.8	Y	Y	Y
SEALAND INTEGRITY	343	99.1	N	Y	Y
SEALAND KODIAK	74	54.0	Y	Y	Y
SEALAND LIBERATOR	163	43.5	Y	Y	Y
SEALAND MARINER	118	100.0	N	N	N
SEALAND MERCURY	85	100.0	Y	Y	Y
SEALAND METEOR	110	70.0	Y	N	Y
SEALAND NAVIGATOR	615	95.7	Y	Y	Y
SEALAND PACER	21	100.0	Y	N	Y
SEALAND PACIFIC	238	92.0	Y	Y	Y
SEALAND PATRIOT	151	42.3	Y	Y	Y
SEALAND PERFORMANCE	135	90.3	Y	Y	Y
SEALAND PRODUCER	351	30.7	Y	Y	Y
SEALAND QUALITY	113	38.9	N	Y	Y
SEALAND RACER	112	72.3	Y	Y	Y
SEALAND RELIANCE	275	57.4	Y	Y	Y
SEALAND SPIRIT	34	100.0	N	N	N
SEALAND TACOMA	184	29.3	Y	Y	Y
SEALAND TRADER	190	86.3	Y	Y	Y
SEALAND VOYAGER	496	93.5	Y	Y	Y
SEARIVER BATON ROUGE	41	58.5	Y	Y	Y
SEARIVER BENICIA	38	42.1	Y	Y	Y
SEARIVER LONG BEACH	10	100.0	Y	N	N
SEARIVER NORTH SLOPE	11	100.0	N	N	N
SEARIVER SAN FRANCISCO	30	56.6	Y	Y	Y
SEAWIND CROWN	94	47.8	Y	Y	Y
SEILLEAN	311	100.0	N	N	N
SENATOR	145	100.0	N	N	N
SENSATION	64	60.9	Y	Y	Y
SETO BRIDGE	152	100.0	N	N	N
SEVEN OCEAN	55	100.0	N	N	N
SEWARD JOHNSON	100	69.0	Y	N	N
SGT. METEJ KOCAK	49	20.4	Y	Y	Y
SHELLY BAY	107	87.8	Y	Y	Y
SHIN OJI	27	100.0	N	N	N
SHIRAOI MARU	201	79.1	Y	Y	Y
SIBOHELLE	26	100.0	Y	Y	Y
SIDNEY STAR	138	100.0	N	N	N
SIERRA MADRE	15	80.0	N	N	Y
SIETE OCEANO	117	0.0	Y	Y	Y
SIGAL	104	18.2	Y	Y	Y
SINCERE GEMINI	40	100.0	N	N	N
SINCERE SUCCESS	291	17.1	Y	Y	Y
SINGA STAR	37	100.0	N	N	N
SKAUBRYN	93	100.0	N	N	N
SKAUGRAN	189	100.0	N	N	N
SKOGAFOSS	85	100.0	N	N	N
SKY PRINCESS	152	89.4	Y	Y	N
SNOW CRYSTAL	132	100.0	N	N	N
SOKOLICA	27	100.0	N	N	N
SOL DO BRASIL	91	91.2	Y	Y	Y
SOLAR WING	91	100.0	N	N	N
SONG OF AMERICA	95	10.5	Y	Y	Y
SONORA	363	76.3	Y	Y	Y
SOREN TOUBRO	48	100.0	N	N	N
SOUTHERN LION	74	100.0	N	N	N
SOUTHERN PRINCESS	305	0.0	Y	Y	Y
SP5. ERIC G. GIBSON	17	5.8	Y	Y	Y
SPAR EIGHT	114	72.8	Y	Y	N
SPRING BEAR	239	100.0	N	N	N
SPRING GANNET	171	46.7	Y	Y	Y
SPRING WAVE	79	27.8	Y	Y	Y
ST BLAIZE	5	100.0	N	N	N
STAR AMERICA	119	47.0	Y	Y	Y
STAR EAGLE	33	100.0	N	N	N
STAR EVVIVA	103	52.4	N	N	Y
STAR FLORIDA	236	100.0	N	N	N
STAR FRASER	206	100.0	N	N	N
STAR FUJI	53	100.0	N	N	N
STAR GRAN	130	100.0	N	N	Y
STAR HANSA	60	20.0	Y	N	N
STAR HARDANGER	4	100.0	N	N	Y
STAR HERDLA	117	89.7	Y	Y	Y
STAR SKARVEN	80	52.5	Y	Y	Y
STAR STRONEN	60	100.0	N	N	N
STATE OF GUIARAT	6	100.0	N	N	N
STATENDAM	40	100.0	N	N	N
STELLA LYKES	81	61.7	Y	Y	Y
STEPAN KRASHENINNIKOV	30	100.0	N	N	N
STEPHAN J	357	65.8	Y	Y	Y
STEWART J. CORT	49	89.7	Y	N	Y
STOLT CONDOR	1	100.0	N	N	N
STOLT TENACITY	73	100.0	N	N	N
STONEWALL JACKSON	29	100.0	Y	N	Y
STRONG CAJUN	55	56.3	Y	Y	Y
STRONG ICELANDER	265	100.0	N	N	N
SUMMER BREEZE	187	100.0	N	N	N
SUN DANCE	31	100.0	Y	Y	Y
SUN PRINCESS	51	90.1	Y	N	N
SUNBELT DIXIE	10	100.0	N	N	N
SUNDA	132	100.0	N	N	N
SUNSHINE AMAZON	56	100.0	N	N	N
SUPER RUBIN	112	91.0	Y	Y	N
SVEN OLTMANN	92	100.0	N	N	N
TADEUSZ OCIOSZYNSKI	2	100.0	N	N	N
TAI HE	71	100.0	N	N	N
TAI SHING	52	88.4	Y	Y	N
TAIKO	30	73.3	N	N	Y
TAKARA	14	21.4	Y	N	N
TAKAYAMA	98	91.8	Y	Y	N
TALLAHASSEE BAY	165	100.0	N	N	N
TANABATA	25	100.0	N	N	N
TARAGO	302	100.0	N	N	N
TARONGA	16	100.0	N	N	N
TELLUS	165	92.1	Y	Y	Y
TEPOZTECO II	121	100.0	N	N	N
TEQUI	60	98.3	Y	Y	N
TEUTONIA	7	100.0	N	N	N
THOMAS G. THOMPSON	159	22.6	Y	Y	Y
TILLIE LYKES	331	100.0	Y	Y	Y
TJALDRID	8	100.0	N	N	N
TMM MEXICO	146	91.7	Y	N	N
TMM VERACRUZ	72	88.8	Y	Y	Y
TOKIO EXPRESS	676	100.0	N	N	N
TOLUCA	108	100.0	N	N	N
TONSINA	108	79.6	Y	Y	Y
TORBEN	380	39.7	Y	N	N
TORM AMERICA	156	69.8	Y	Y	Y
TORM FREYA	106	82.0	Y	Y	Y
TOWER BRIDGE	37	100.0	N	N	N

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NAME	TOTAL OBS	PERCENT VIA RADIO	MANUSCRIPT RECEIVED JAN	FEB	MAR
TRADE APOLLO	57	100.0	N	N	N
TRANSWORLD BRIDGE	125	100.0	Y	Y	Y
TRIGGER	1	100.0	N	N	N
TROPIC DAY	52	0.0	Y	Y	Y
TROPIC FLYER	24	0.0	N	Y	N
TROPIC ISLE	43	65.1	Y	N	Y
TROPIC JADE	22	40.9	N	Y	Y
TROPIC LURE	48	31.2	Y	Y	Y
TROPIC MIST	13	0.0	Y	Y	N
TROPIC SUN	154	94.1	Y	Y	Y
TROPIC TIDE	52	98.0	Y	Y	Y
TROPICALE	161	49.0	Y	Y	Y
TRSL ARCTURUS	73	100.0	N	N	N
TRUST 38	140	17.8	Y	Y	Y
TSL GALLANT	8	100.0	N	N	N
TULSIDAS	11	100.0	N	N	N
TURMOIL	111	100.0	N	N	N
TYSON LYKES	110	40.0	Y	Y	Y
ULLSWATER	45	100.0	N	N	N
USCGC ACACIA (WLB406)	2	100.0	Y	N	N
USCGC ACTIVE WMEC 618	32	0.0	Y	N	Y
USCGC ACUSHNET WMEC 16	86	100.0	N	N	N
USCGC ALERT (WMEC 630)	20	100.0	N	N	N
USCGC BASSWOOD (WLB 38	3	100.0	N	N	N
USCGC BEAR (WEMC 901)	86	48.8	Y	Y	N
USCGC BOUTWELL WHEC 71	46	100.0	N	N	Y
USCGC CAMPBELL	1	100.0	N	N	N
USCGC CHASE (WHEC 718)	14	100.0	N	N	N
USCGC CONFIDENCE WMEC6	99	0.0	N	Y	Y
USCGC COURAGEOUS	54	33.3	Y	Y	Y
USCGC DAUNTLESS WMEC 6	31	100.0	N	N	N
USCGC DILIGENCE WMEC 6	7	100.0	N	N	N
USCGC DURABLE (WMEC 62	51	100.0	Y	N	N
USCGC EAGLE (WIX 327)	5	100.0	N	N	N
USCGC FIREBUSH WLB 393	3	100.0	N	N	N
USCGC FORWARD	38	100.0	N	N	N
USCGC HAMILTON WHEC 71	4	100.0	N	N	N
USCGC HARRIET LANE	22	100.0	N	N	N
USCGC IRONWOOD (WLB 29)	18	100.0	N	N	N
USCGC JARVIS (WHEC 725)	97	100.0	Y	Y	Y
USCGC LEGARE	68	100.0	N	N	N
USCGC MACKINAW	7	100.0	N	N	Y
USCGC MELLON (WHEC 717)	183	68.3	Y	Y	Y
USCGC MIDGETT (WHEC 72)	51	84.3	Y	N	Y
USCGC MOBILE BAY	5	100.0	N	N	N
USCGC MOHAWK WMEC 913	21	100.0	N	N	N
USCGC MUNRO	1	100.0	N	N	N
USCGC POLAR SEA (WAGB)	555	4.6	Y	Y	Y
USCGC RELIANCE WMEC 61	35	100.0	N	N	N
USCGC SASSAFRAS	12	100.0	N	N	N
USCGC SEDGE (WLB 402)	24	100.0	N	N	N
USCGC SENECA	34	100.0	N	N	N
USCGC SPENCER	21	100.0	N	N	N
USCGC STEADFAST (WMEC)	66	12.1	Y	Y	N
USCGC STORIS (WMEC 38)	19	100.0	N	N	N
USCGC SUNDEW (WLB 404)	9	100.0	N	N	Y
USCGC SWEETBRIER WLB 4	3	100.0	N	N	Y
USCGC TAHOMA	98	82.6	Y	Y	Y
USCGC THETIS	7	28.5	Y	N	N
USCGC VALIANT (WMEC 62)	18	66.6	Y	Y	Y
USCGC VENTUROUS WMEC 6	34	64.7	Y	N	N
USCGC VIGILANT WMEC 61	16	100.0	N	N	N
USCGC VIGOROUS WMEC 62	1	100.0	N	N	Y
USCGC WOODRUSH (WLB 40)	27	100.0	N	N	N
USNS ALGOL	24	100.0	N	N	Y
USNS BOWDITCH	25	0.0	Y	N	N
USNS CONCORD	198	0.0	Y	Y	Y
USNS GUS W. DARNELL	142	61.9	Y	Y	N
USNS HAYES	70	0.0	N	Y	Y
USNS HENRY J. KAISER	1	100.0	N	N	N
USNS JOHN MCDONNELL	114	64.9	Y	Y	Y
USNS KANE TAGS 27	119	29.4	Y	Y	Y
USNS MOHAWK (T-ATF 170)	22	18.1	Y	Y	N
USNS NARRAGANSETT	29	100.0	N	N	N
USNS PATHFINDER T-AGS	275	13.8	Y	Y	Y
USNS PATUXENT	50	0.0	Y	Y	Y
USNS POWHATAN TATF 166	31	64.5	Y	N	N
USNS RAPPAHANNOCK TAO	3	100.0	N	N	N
USNS SILAS BENT T-AGS	157	17.8	Y	Y	N
USNS SIRIUS (T-AFS 8)	24	0.0	Y	Y	Y
USNS SPICA (T-AFS 9)	12	100.0	N	N	N
USNS SUMNER	207	0.0	Y	Y	Y
USNS VANGUARD TAG 194	110	100.0	N	N	Y
USNS YUKON (T-AO 202)	58	0.0	Y	Y	N
USS RUSSELL DDG-59	4	100.0	N	N	N
VASILTY BURKHANOV	127	100.0	N	N	N
VEENDAM	2	100.0	N	N	N
VENUS DIAMOND	51	100.0	N	N	N
VINE	142	100.0	N	N	N
VIRGINIA	346	11.2	Y	Y	Y
VISAYAN GLORY	144	52.0	Y	Y	Y
VIVA	125	13.6	Y	N	N
WASHINGTON HIGHWAY	77	100.0	N	N	N
WASHINGTON SENATOR	129	100.0	N	N	N
WESTERN LION	45	100.0	N	Y	N
WESTWARD	65	89.2	Y	N	N
WESTWARD VENTURE	337	83.9	Y	Y	Y
WESTWOOD ANETTE	92	69.5	Y	Y	Y
WESTWOOD BELINDA	143	88.1	Y	Y	N
WESTWOOD CLEO	22	100.0	Y	N	N
WESTWOOD FUJI	170	97.0	Y	Y	Y
WESTWOOD HALLA	453	90.2	Y	N	N
WESTWOOD JAGO	156	58.9	Y	Y	Y
WESTWOOD MARIANNE	131	74.0	Y	Y	Y
WILFRED SYKES	8	87.5	N	N	Y
WILLIAM E. CRAIN	70	0.0	N	N	Y
WILLIAM E. MUSSMAN	53	0.0	Y	N	N
YUCATAN	36	100.0	N	N	N
YURIY OSTROVSKIY	236	93.6	Y	Y	Y
ZENITH	27	100.0	N	N	N
ZETLAND	166	100.0	N	N	N
ZIM AMERICA	77	100.0	N	N	N
ZIM ASIA	146	100.0	N	N	N
ZIM CANADA	87	100.0	N	N	N
ZIM HONGKONG	1	100.0	N	N	N
ZIM IBERIA	128	100.0	N	N	N
ZIM ISRAEL	27	100.0	N	N	N
ZIM ITALIA	88	100.0	N	N	N
ZIM JAMAICA	30	100.0	N	N	N
ZIM JAPAN	64	100.0	N	N	N
ZIM KEELUNG	30	100.0	N	N	N
ZIM KOREA	92	100.0	N	N	N
ZIM MONTEVIDEO	31	100.0	N	N	N
ZIM SANTOS	60	95.0	N	Y	Y
GRAND TOTAL	104,922				
TOTAL VIA RADIO	80,961				
PERCENT VIA RADIO		77.2			

Buoy Climatological Data Summary —

4th Quarter 1996 and 1st Quarter 1997

Weather observations are taken each hour during a 20-minute averaging period, with a sample taken every 0.67 seconds. The significant wave height is defined as the average height of the highest one-third of the waves during the average period each hour. The maximum significant wave height is the highest of those values for that month. At most stations, air temperature, water temperature, wind speed and direction are sampled once per second during an 8.0-minute averaging period each hour (moored buoys) and a 2.0-minute averaging period for fixed stations (C-MAN). Contact NDBC Data Systems Division, Bldg. 1100, Stennis Space Center, MS 39529, or phone (601) 688-1720 for more details.

BUOY	LAT	LONG	OBS	MEAN AIR TP (C)	MEAN SEA TP (C)	MEAN SIG WAVE HT (M)	MAX SIG WAVE HT (M)	MAX SIG WAVE HT (DA/HR)	SCALAR MEAN WIND SPEED (KNOTS)	PREV WIND (DIR)	MAX WIND (KTS)	MAX WIND (DA/HR)	MEAN PRESS (MB)
MARCH	**1997**												
41001	34.7N	072.6W	0740	16.5	19.7	2.2	5.6	31/23	14.8	S	36.3	31/23	1018.4
41002	32.3N	075.2W	0740	19.8	21.5	1.8	5.4	31/23	13.4	SW	29.3	31/18	1018.5
41004	32.5N	079.1W	0740	19.2		1.3	4.6	14/14	13.1	SW	30.1	31/23	1017.7
41009	28.5N	080.2W	1486	22.7	23.3	1.1	3.5	25/14	13.3	SE	30.9	31/17	1018.6
41010	28.9N	078.5W	1460	22.9	24.2	1.6	4.2	14/11	13.4	E	29.0	31/17	1017.7
42001	25.9N	089.7W	0707	23.1	23.8	1.1	2.7	07/08	12.1	E	28.6	26/19	1017.9
42002	25.9N	093.6W	0739	22.5	22.7	1.2	2.8	06/19	11.3	SE	28.4	18/00	1016.1
42007	30.1N	088.8W	0707	18.1	18.6	0.6	1.8	13/22	10.8	SE	28.6	31/09	1018.1
42019	27.9N	095.0W	0740	20.1		1.2	3.3	06/14	11.9	SE	31.9	17/18	1016.3
42035	29.3N	094.4W	0741	18.1	18.4	0.8	2.2	17/00					1016.5
42036	28.5N	084.5W	0741	20.6	20.9	0.7	2.6	31/18	9.3	S	26.6	29/15	1018.0
42039	28.8N	086.0W	0741	21.1	21.5	0.8	2.6	31/15	9.8	SE	25.1	31/14	1019.0
42040	29.2N	088.3W	0739	19.8	20.7	1.0	3.2	31/13	10.7	SE	27.4	31/09	1018.9
44004	38.5N	070.7W	0742	8.1	10.2	2.6	6.6	15/11					1017.5
44005	42.9N	069.0W	0738		4.4				16.2	NW	40.8	06/21	1013.9
44007	43.5N	070.2W	0738	0.6	3.4	0.9	3.1	31/23	12.5	NW	28.4	31/21	1014.0
44008	40.5N	069.4W	0723	3.7	4.6	2.1	7.8	06/21					1015.7
44009	38.5N	074.7W	0743	8.8	7.0	1.2	3.2	04/08	14.1	S	35.0	31/18	1017.1
44011	41.1N	066.6W	0730	3.0	3.9	2.6	8.9	07/04	16.8	NW	39.2	07/00	1013.8
44013	42.4N	070.7W	0725	2.3	3.7	0.9	5.6	31/23	14.2	W	37.9	06/18	1014.9
44014	36.6N	074.8W	0737	9.7	9.6	1.5	4.1	14/23	12.4	S	31.1	31/23	1018.3
44025	40.3N	073.2W	0737	4.7	5.2	1.4	4.3	26/10	14.8	W	35.4	06/15	1016.3
44028	41.4N	071.1W	0735	2.9	4.1	1.1	3.8	26/11	15.6	NW	43.9	31/21	1015.7
45002	45.3N	086.4W	0404	-1.0	1.1	0.8	3.9	17/06	13.3	N	34.0	15/00	1014.6
45007	42.7N	087.0W	0264	2.6	2.4	0.8	2.1	25/06	12.3	N	26.2	25/02	1011.5
46001	56.3N	148.2W	0740	2.4	4.2	2.7	6.8	17/05	13.4	W	35.6	17/11	
46002	42.5N	130.3W	0704	10.1	10.4	3.4	7.6	02/16	14.2	SW	31.1	18/00	1018.6
46003	51.9N	155.9W	0738	2.3	3.9	3.7	12.7	27/04	15.6	W	34.6	26/23	1008.8
46005	46.1N	131.0W	0359	8.3	9.0	3.6	6.7	28/19	17.4	SW	35.0	30/13	1014.8
46006	40.9N	137.5W	0717	11.5	12.1	3.6	6.4	28/15					1020.5
46011	34.9N	120.9W	0742	11.7	11.9	2.3	4.4	01/00	10.0	NW	26.8	31/23	1017.6
46012	37.4N	122.7W	0744	10.5		2.3	3.9	03/03	11.0	NW	26.0	12/04	1018.6
46013	38.2N	123.3W	0713	10.4		2.5	4.6	03/04	14.7	NW	31.3	24/02	1019.8
46014	39.2N	124.0W	0740	10.5	10.5	2.8	6.2	02/22	13.7	NW	28.6	23/23	1019.7
46022	40.7N	124.5W	0739	10.4	10.8	2.8	6.3	02/20	12.8	N	30.9	02/01	1021.0
46025	33.8N	119.1W	0737	14.3	15.1	1.1	1.8	04/04	5.5	W	14.6	06/08	1016.3
46026	37.8N	122.8W	0738	10.2	10.2	2.1	3.9	03/05	11.3	NW	25.6	16/23	1018.8
46027	41.9N	124.4W	0739	9.8	10.2	2.6	5.5	02/16	12.1	NW	33.4	02/00	1020.4
46028	35.7N	121.9W	0741	11.2	11.7	2.5	4.9	30/06	13.9	NW	29.7	08/13	1018.4

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BUOY	LAT	LONG	OBS	MEAN AIR TP (C)	MEAN SEA TP (C)	MEAN SIG WAVE HT (M)	MAX SIG WAVE HT (M)	MAX SIG WAVE HT (DA/HR)	SCALAR MEAN WIND SPEED (KNOTS)	PREV WIND (DIR)	MAX WIND (KTS)	MAX WIND (DA/HR)	MEAN PRESS (MB)
46029	46.2N	124.2W	0739	8.2	8.9	3.1	8.8	30/23	14.1	S	39.2	18/12	1017.8
46030	40.4N	124.5W	0738	9.9	9.7	2.7	5.7	02/17	13.6	N	27.6	01/21	1021.4
46035	56.9N	177.8W	0724	0.5	2.6	2.7	6.8	11/09	17.6	E	33.8	24/19	1014.2
46041	47.4N	124.5W	0737		6.7	2.9	7.5	31/00	13.5	SE	38.5	30/21	1016.1
46042	36.8N	122.4W	0743		11.0	2.5	5.0	30/02	9.6	NW	23.5	12/00	1019.5
46045	33.8N	118.5W	0743	14.5	15.2	0.9	1.8	01/00					1016.2
46054	34.3N	120.5W	0723	12.4	12.7	2.2	3.8	08/04	13.9	NW	33.4	31/22	1016.8
46059	38.0N	130.0W	0739	13.1	14.3	2.9	5.8	02/22	13.6	NW	29.0	18/20	1023.7
46060	60.6N	146.8W	1482	1.6	4.0	0.6	1.7	06/04	9.9	N	29.1	06/04	1006.1
46061	60.2N	146.8W	1472	0.5	3.7	1.5	4.4	18/01	12.8	N	34.4	18/06	1005.9
51001	23.4N	162.3W	0739	22.8	23.7	2.9	5.1	14/05	13.5	NE	25.7	23/10	1017.5
51002	17.2N	157.8W	0739	24.9	25.5	2.4	4.4	07/00	14.5	E	25.2	07/08	1014.0
51003	19.1N	160.8W	0742	24.5	25.3	2.3	4.0	25/13	13.0	E	22.6	23/13	1013.6
51004	17.4N	152.5W	0733	24.3		2.5	4.0	07/09	14.5	E	25.9	08/01	1015.1
91204	9.9N	139.7E	0518	28.8					13.6	NE	25.2	02/06	1010.5
91222	18.1N	145.8E	0123	25.0									1013.8
91251	11.4N	162.4E	0738	27.8					15.1	NE	27.5	01/13	1007.7
91328	8.6N	149.7E	0735	27.3					8.9	NE	24.3	10/20	1010.0
91343	7.6N	155.2E	0734	27.7									1007.5
91352	6.2N	160.7E	0742	28.1					7.5	NE	19.0	14/01	1008.5
91355	5.4N	163.0E	0742	28.0					7.2	E	20.9	14/03	1006.8
91374	8.7N	171.2E	0743	27.7					6.1	NE	16.7	16/06	1008.7
91377	6.1N	172.1E	0496	28.5									1010.5
91411	8.3N	137.5E	0676	27.1									1010.3
91442	4.6N	168.7E	0740	28.7					9.1	SE	30.7	14/07	1007.8
ABAN6	44.3N	075.9W	0738	-1.9	0.2				5.0	N	19.5	06/07	1016.8
ALSN6	40.5N	073.8W	0737	5.1		0.9	3.7	14/21	18.4	NW	50.9	06/13	1016.8
BLIA2	60.8N	146.9W	1476	0.4					17.6	N	41.3	11/09	1006.9
BURL1	28.9N	089.4W	0739	18.2					13.2	NE	35.1	13/18	1017.2
CARO3	43.3N	124.4W	0743	9.4					12.4	S	38.3	01/22	1020.2
CDRF1	29.1N	083.0W	0742	20.7					8.3	W	24.6	29/16	1018.9
CHLV2	36.9N	075.7W	0742	9.7	9.1	1.0	2.4	19/16	15.9	N	39.3	31/23	1018.8
CLKN7	34.6N	076.5W	0739	15.4					12.2	SW	34.1	31/20	1019.5
CSBF1	29.7N	085.4W	0741	19.5					7.1	E	21.1	29/16	1019.2
DBLN6	42.5N	079.4W	0737	1.0					12.9	SW	41.5	15/06	1016.5
DPIA1	30.3N	088.1W	0742	18.3	18.8				10.9	SE	36.9	31/10	1018.7
DRYF1	24.6N	082.9W	0737	24.4					11.2	E	24.2	14/19	1018.0
DSLN7	35.2N	075.3W	0739	15.0		1.4	5.2	15/03	18.9	SW	48.1	14/21	1018.2
DUCN7	36.2N	075.8W	0734	11.5		0.8	2.1	09/12	13.0	NE	30.4	31/21	1019.6
FBIS1	32.7N	079.9W	0737	17.3					9.2	SW	24.5	24/19	1018.8
FFIA2	57.3N	133.6W	0734	2.0					16.4	N	37.7	25/11	1007.5
FPSN7	33.5N	077.6W	0737	17.7		1.4	4.6	14/17	16.8	SW	39.9	31/22	1017.7
FWYF1	25.6N	080.1W	0719	24.2	25.2				13.9	E	31.8	14/07	1018.6
GDIL1	29.3N	090.0W	0737	19.3	20.6				9.9	SE	29.8	31/10	1018.3
IOSN3	43.0N	070.6W	0735	0.9					16.1	NW	44.0	06/19	1014.4
KTNF1	29.8N	083.6W	0740	19.6					8.9	SW	22.6	29/21	1018.6
LKWF1	26.6N	080.0W	0737	23.5	25.0				11.7	SE	30.0	14/11	1018.4
MDRM1	44.0N	068.1W	0737	-0.2					18.7	NW	42.7	31/23	1013.6
MISM1	43.8N	068.9W	0736	-0.2					17.3	W	44.0	31/23	1014.2
MLRF1	25.0N	080.4W	0737	24.4	25.4				12.4	SE	28.9	14/22	1018.5
NWPO3	44.6N	124.1W	0740	8.5					11.4	S	39.7	01/16	1019.7
PILM4	48.2N	088.4W	0742	-5.0					13.0	NW	32.0	25/05	1018.2
POTA2	61.1N	146.7W	1479	-0.6					22.1	NE	41.6	11/20	1007.0
PTAT2	27.8N	097.1W	0353	17.6	17.1				12.4	E	28.7	02/12	1017.0
ROAM4	47.9N	089.3W	0268	-7.1					14.7	N	34.0	14/21	1021.9
SANF1	24.5N	081.9W	0735	24.6	25.0				12.2	E	28.8	14/21	1017.7
SAUF1	29.9N	081.3W	0734	19.7	18.3				9.0	SW	24.5	25/11	1019.1
SBIO1	41.6N	082.8W	0740	2.7					14.3	W	40.1	15/02	1017.6
SGNW3	43.8N	087.7W	0738	-0.2					11.4	W	26.2	16/23	1018.0
SISW1	48.3N	122.9W	0741	7.1					14.7	SE	48.8	31/00	1016.2
SMKF1	24.6N	081.1W	0738	24.8	25.5				13.5	E	32.4	14/22	1018.5
SPGF1	26.7N	079.0W	0741	23.7	25.4				8.7	E	25.9	22/13	1019.3
SRST2	29.7N	094.1W	0743	17.6					10.5	SE	28.7	17/12	1017.5
STDM4	47.2N	087.2W	0724	-3.7					14.5	NW	36.9	15/00	1016.7
SUPN6	44.5N	075.8W	0736	-2.3	0.2				11.0	SW	31.6	15/07	1017.1
THIN6	44.3N	076.0W	0740	-2.0									
TPLM2	38.9N	076.4W	0710	8.0	7.0				13.3	NW	36.1	29/19	1018.2
TTIW1	48.4N	124.7W	0738	6.7					17.3	E	46.1	18/05	1015.4
VENF1	27.1N	082.5W	0740	22.0	24.2				9.0	E	26.5	14/07	1019.3
WPOW1	47.7N	122.4W	0729	7.3					12.7	S	45.2	31/02	1017.6
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41001	34.7N	072.6W	0667	16.1	19.7	2.1	3.9	15/15	15.3	S	32.1	11/03	1022.3
41002	32.3N	075.2W	0665	18.8	21.3	1.8	3.8	14/11	12.9	S	26.8	15/10	1022.0
41004	32.5N	079.1W	0665	16.0	25.6	1.4	3.7	13/18	12.6	NE	31.7	13/17	1021.6
41009	28.5N	080.2W	1338	21.3	22.4	1.3	2.4	17/08	12.9	SE	27.0	10/19	1021.1
41010	28.9N	078.5W	1315	21.8	23.6	1.7	3.3	15/09	13.0	SE	24.1	16/19	1020.4
42001	25.9N	089.7W	0647	21.5	23.1	1.5	2.7	15/02	14.7	SE	27.8	13/04	1019.6
42002	25.9N	093.6W	0672	20.3	21.4	1.6	3.7	22/15	14.4	SE	29.1	14/15	1017.8
42003	25.9N	085.9W	0179	21.7	22.6				11.5	SE	22.7	17/14	1018.1
42007	30.1N	088.8W	0672	13.5	15.0	0.7	3.0	13/08	13.5	NE	38.9	13/05	1021.2
42019	27.9N	095.0W	0669	17.5		1.5	3.7	24/03	14.6	NE	28.6	07/20	1018.4

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BUOY	LAT	LONG	OBS	MEAN AIR TP (C)	MEAN SEA TP (C)	MEAN SIG WAVE HT (M)	MAX SIG WAVE HT (M)	MAX SIG WAVE HT (DA/HR)	SCALAR MEAN WIND SPEED (KNOTS)	PREV WIND (DIR)	MAX WIND (KTS)	MAX WIND (DA/HR)	MEAN PRESS (MB)
42035	29.3N	094.4W	0666	13.4	14.4	1.0	2.7	13/00					1018.9
42036	28.5N	084.5W	0666	18.1	19.6	0.9	2.0	15/17	11.7	NE	22.2	24/03	1020.4
42039	28.8N	086.0W	0667	18.6	20.9	1.0	2.7	13/14	13.1	SE	27.4	13/13	1021.3
42040	29.2N	088.3W	0666	17.2	20.5	1.3	3.7	13/10	13.8	N	36.3	13/10	1021.2
44004	38.5N	070.7W	0658	9.2	12.7	2.3	4.5	09/03					1021.7
44005	42.9N	069.0W	0665		4.6				16.0	SW	31.9	20/10	1018.0
44007	43.5N	070.2W	0670		3.2	1.1	3.1	01/14	12.0	N	26.4	21/07	1017.9
44008	40.5N	069.4W	0647	4.1	4.9	2.2	5.1	09/11					1020.2
44009	38.5N	074.7W	0669		5.5	1.3	4.4	09/08	13.5	NW	29.9	09/02	1021.8
44011	41.1N	066.6W	0662	3.8	4.1	2.5	7.0	09/20	16.4	W	38.9	09/16	1018.5
44013	42.4N	070.7W	0645	2.4	3.4	1.0	3.3	17/14	13.4	W	31.5	20/06	1019.0
44014	36.6N	074.8W	0662	8.1	8.3	1.6	4.5	09/06	12.8	N	29.7	09/03	1022.7
44025	40.3N	073.2W	0648	3.9	5.0	1.4	3.7	22/07	14.8	W	30.7	22/06	1021.0
44028	41.4N	071.1W	0666	2.5	3.1	1.1	2.8	22/22	15.3	SW	36.9	25/05	1019.9
46001	56.3N	148.2W	0670	3.7	4.0	3.4	7.0	04/13	14.8	SE	33.6	02/11	
46002	42.5N	130.3W	0633	10.4	10.5	3.2	5.5	03/19	13.9	W	31.7	03/14	1022.0
46003	51.9N	155.9W	0668	3.9	4.0	3.9	8.2	10/13	13.1	SW	28.2	01/21	996.5
46005	46.1N	131.0W	0461	9.3	9.2	3.3	5.5	03/18	14.0	S	30.7	03/16	1021.2
46006	40.9N	137.5W	0644	12.1	12.4	3.5	6.6	09/09					1022.9
46011	34.9N	120.9W	0669	12.3	12.6	2.5	5.4	27/14	12.8	NW	29.7	18/00	1018.3
46012	37.4N	122.7W	0671	11.6		2.6	6.3	27/07	13.2	NW	36.9	27/08	1019.4
46013	38.2N	123.3W	0644	11.5	11.9	2.8	6.1	27/03	15.4	NW	36.7	27/00	1021.1
46014	39.2N	124.0W	0669	11.0	11.5	2.7	4.8	28/05	12.0	NW	33.0	27/01	1021.1
46022	40.7N	124.5W	0663	10.7	11.5	2.8	5.6	28/05	12.1	N	31.9	16/20	1022.2
46025	33.8N	119.1W	0659	14.0	14.2	1.5	3.5	17/23	8.7	NW	32.6	17/23	1016.2
46026	37.8N	122.8W	0666	11.3	11.5	2.4	5.2	27/07	13.3	NW	34.8	27/09	1019.8
46027	41.9N	124.4W	0669	10.2	10.9	2.6	4.6	12/21	10.6	NW	29.5	27/23	1022.2
46028	35.7N	121.9W	0664	12.0	12.5	2.9	6.8	27/13	16.0	NW	31.9	27/13	1019.4
46029	46.2N	124.2W	0671	7.7	8.3	2.6	7.0	12/12	12.6	E	34.8	19/00	1022.0
46030	40.4N	124.5W	0665	10.5	10.9	2.7	4.7	18/18	12.9	N	27.0	26/20	1022.6
46035	56.9N	177.8W	0664	-0.7	2.8	2.8	7.3	07/05	20.1	NE	39.8	07/05	998.4
46041	47.4N	124.5W	0670		8.3	2.5	8.8	12/11	9.8	SE	32.6	12/10	1021.1
46042	36.8N	122.4W	0670		12.2	2.7	6.5	27/10	9.6	NW	23.3	28/02	1020.3
46045	33.8N	118.5W	0670	13.9	14.2	1.1	3.4	28/02					1016.0
46054	34.3N	120.5W	0641	12.6	12.7	2.6	5.1	27/18	17.1	NW	35.4	18/02	1017.6
46059	38.0N	130.0W	0670	13.4	14.6	2.9	6.2	10/02	12.9	NW	28.6	03/13	1025.2
46060	60.6N	146.8W	1337	3.0	4.3	1.0	3.0	06/13	14.4	E	37.7	06/12	1005.7
46061	60.2N	146.8W	1330	3.4	4.2	2.5	7.3	06/03	17.5	E	43.7	03/13	1005.3
51001	23.4N	162.3W	0670	22.9	23.8	3.2	6.2	13/11	10.6	E	26.1	26/05	1018.1
51002	17.2N	157.8W	0672	24.7	25.5	2.9	4.3	24/02	16.9	E	25.0	16/17	1014.1
51003	19.1N	160.8W	0672	24.4	25.2	2.7	4.4	24/00	12.4	E	24.0	23/19	1014.2
51004	17.4N	152.5W	0666	24.2		2.9	4.7	27/01	16.0	SW	24.8	24/10	1014.9
91204	9.9N	139.7E	0491	29.0					16.2	NE	29.1	24/09	1008.5
91222	18.1N	145.8E	0131	24.8									1013.5
91251	11.4N	162.4E	0667	27.7					17.6	NE	28.6	13/08	1008.5
91328	8.6N	149.7E	0666	27.7					9.1	NE	22.4	16/07	1009.0
91343	7.6N	155.2E	0665	27.9									1006.9
91352	6.2N	160.7E	0669	27.9					12.0	NE	23.7	02/23	1007.8
91355	5.4N	163.0E	0670	27.8					8.3	NE	27.3	11/21	1006.2
91374	8.7N	171.2E	0671	27.4					7.2	NE	14.4	05/05	1008.5
91377	6.1N	172.1E	0444	28.1					7.4	E	17.5	09/18	1009.8
91411	8.3N	137.5E	0641	27.2									1007.8
91442	4.6N	168.7E	0668	28.2					11.7	NE	27.2	20/16	1007.1
ABAN6	44.3N	075.9W	0668	-3.6	0.2				4.4	N	16.2	17/02	1020.5
ALSN6	40.5N	073.8W	0668	4.1		1.0	2.5	09/10	17.5	W	41.9	22/06	1021.1
BLIA2	60.8N	146.9W	1337	2.4					11.2	NE	30.4	22/23	1006.7
BURL1	28.9N	089.4W	0666	14.0					14.0	N	31.1	13/05	1020.4
CARO3	43.3N	124.4W	0668	9.0					8.8	SE	31.4	16/22	1022.7
CDRF1	29.1N	083.0W	0668	16.5					8.4	NE	20.0	25/22	1021.7
CHLV2	36.9N	075.7W	0589	7.5	6.6				15.8	SW	35.2	27/23	1022.6
CLKN7	34.6N	076.5W	0668	11.2					11.4	N	29.6	13/23	1023.8
CSBF1	29.7N	085.4W	0670	15.0					6.3	E	16.1	08/13	1021.9
DBLN6	42.5N	079.4W	0666	-0.4					12.8	SW	47.4	27/21	1020.0
DPIA1	30.3N	088.1W	0667	13.3	13.5				12.4	N	28.0	13/10	1021.7
DRYF1	24.6N	082.9W	0665	22.1					12.1	NE	24.6	17/03	1019.5
DSLN7	35.2N	075.3W	0670	11.8		1.5	3.5	09/11	19.4	N	46.3	14/13	1022.4
DUCN7	36.2N	075.8W	0665	8.7		0.8	2.3	09/11	12.5	N	33.1	09/03	1024.0
FBIS1	32.7N	079.9W	0664	11.6					7.9	NE	28.0	13/18	1022.9
FFIA2	57.3N	133.6W	0667	3.6					11.0	SE	28.7	05/18	1013.8
FPSN7	33.5N	077.6W	0669	15.2		1.5	3.7	14/18	16.9	N	38.9	14/08	1021.7
FWYF1	25.6N	080.1W	0644	23.7	24.4				15.2	SE	31.1	17/16	1020.5
GDIL1	29.3N	090.0W	0668	14.6	15.5				12.0	NE	29.4	22/10	1020.8
IOSN3	43.0N	070.6W	0667	0.9					15.6	W	36.0	20/07	1018.3
KTNF1	29.8N	083.6W	0666	15.1					8.8	NE	22.4	21/15	1021.5
LKWF1	26.6N	080.0W	0667	22.5	24.0				13.0	SE	25.9	17/13	1020.5
MDRM1	44.0N	068.1W	0666	-0.2					17.5	NW	40.1	20/10	1017.8
MISM1	43.8N	068.9W	0665	-0.2					16.7	SW	43.3	20/10	1018.2
MLRF1	25.0N	080.4W	0664	23.6	24.4				13.8	SE	28.0	18/03	1020.2
NWPO3	44.6N	124.1W	0668	7.9					9.4	E	35.5	19/05	1022.9
PILM4	48.2N	088.4W	0668	-8.4					12.8	N	35.5	13/16	1020.1
POTA2	61.1N	146.7W	1337	0.9					16.4	N	33.8	16/12	1006.6
PTAT2	27.8N	097.1W	0668	14.0	14.2				12.3	NE	29.8	22/04	1018.9
ROAM4	47.9N	089.3W	0556	-9.0					16.1	N	42.4	25/11	1021.3

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BUOY	LAT	LONG	OBS	MEAN AIR TP (C)	MEAN SEA TP (C)	MEAN SIG WAVE HT (M)	MAX SIG WAVE HT (M)	MAX SIG WAVE HT (DA/HR)	SCALAR MEAN WIND SPEED (KNOTS)	PREV WIND (DIR)	MAX WIND (KTS)	MAX WIND (DA/HR)	MEAN PRESS (MB)
SANF1	24.5N	081.9W	0665	23.2	23.9				13.9	E	28.4	18/04	1019.2
SAUF1	29.9N	081.3W	0664	15.9	15.2				10.5	N	26.7	23/20	1022.3
SBIO1	41.6N	082.8W	0665	-0.1					13.1	SW	37.0	27/16	1021.2
SGNW3	43.8N	087.7W	0668	-3.1					11.4	W	33.5	21/22	1020.9
SISW1	48.3N	122.9W	0670	6.3					9.2	SE	35.8	12/15	1021.6
SMKF1	24.6N	081.1W	0665	23.7	24.4				15.8	SE	31.1	17/23	1020.0
SPGF1	26.7N	079.0W	0669	22.7					8.1	E	22.0	18/12	1021.2
SRST2	29.7N	094.1W	0668	12.1					10.8	NE	26.1	13/00	1020.2
STDM4	47.2N	087.2W	0668	-5.3					16.4	W	34.7	14/01	1018.2
SUPN6	44.5N	075.8W	0669	-4.3	0.2				10.6	SW	46.4	22/18	1020.8
THIN6	44.3N	076.0W	0668	-3.7									
TPLM2	38.9N	076.4W	0664	5.1	3.6				11.4	NW	37.4	22/03	1023.3
TTIW1	48.4N	124.7W	0670	6.8					14.7	E	38.1	12/11	1021.0
VENF1	27.1N	082.5W	0668	18.9	19.6				8.6	E	23.6	10/19	1021.5
WPOW1	47.7N	122.4W	0664	6.8					9.3	S	33.4	12/12	1022.3

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41001	34.7N	072.6W	0738	14.7	21.4	2.5	6.4	11/15	17.7	W	35.6	31/04	1018.2
41002	32.3N	075.2W	0736	17.1	20.6	2.1	5.1	19/00	15.1	W	31.3	19/00	1018.7
41004	32.5N	079.1W	0583	12.8	18.6	1.5	3.4	11/08	15.5	NE	33.0	11/08	1020.2
41009	28.5N	080.2W	1476	19.3	22.9	1.1	2.9	15/15	12.8	NW	28.8	18/11	1019.9
41010	28.9N	078.5W	1469	20.6	23.8	1.5	3.6	18/19	13.1	NW	28.8	18/12	1018.6
42001	25.9N	089.7W	0699	21.2	23.4	1.4	3.8	14/11	12.8	SE	27.8	09/23	1019.6
42003	25.9N	085.9W	0670	21.2	23.2				12.0	E	30.9	10/00	1018.9
42007	30.1N	088.8W	0739	11.7	14.8	0.7	1.5	07/11	13.3	NE	29.1	17/00	1020.8
42019	27.9N	095.0W	0737	16.5		1.5	4.0	13/17	14.7	NE	29.0	09/18	1019.0
42020	27.0N	096.5W	0320	17.1		2.1	5.1	12/17	9.6	S	21.8	04/04	1015.8
42035	29.3N	094.4W	0732	11.4	13.8	0.9	2.4	07/10					1019.7
42036	28.5N	084.5W	0734	17.5	20.3	1.0	4.1	10/06	11.3	NE	29.9	10/02	1019.7
42039	28.8N	086.0W	0737	18.1	21.7	1.1	4.5	10/02	12.8	S	29.0	09/23	1020.6
42040	29.2N	088.3W	0736	16.5	21.1	1.3	2.8	09/23	14.1	NE	28.8	28/13	1020.7
44004	38.5N	070.7W	0647	7.6	13.4	2.8	6.1	16/22	18.0	W	40.0	11/14	1016.8
44005	42.9N	069.0W	0738	-6.9	5.3				19.3	W	37.9	17/10	1012.7
44007	43.5N	070.2W	0736	-2.5	5.0	1.1	6.1	28/13	15.1	W	35.0	17/07	1012.7
44008	40.5N	069.4W	0714	2.7	5.8	2.4	5.9	17/04	16.0	W	34.0	11/16	1015.2
44009	38.5N	074.7W	0732		6.6	1.2	2.9	11/11	17.2	NW	36.9	17/03	1017.8
44011	41.1N	066.6W	0708	2.8	5.7	2.8	6.8	08/03	18.5	W	39.4	11/18	1013.3
44013	42.4N	070.7W	0731	-0.5	4.9	1.0	3.3	25/12	16.4	W	34.0	07/23	1014.2
44014	36.6N	074.8W	0739	6.6	10.1	1.6	4.2	11/13	15.0	NW	33.6	11/09	1018.9
44025	40.3N	073.2W	0725	1.8	6.2	1.5	3.8	17/04	17.8	W	33.4	10/04	1016.5
44028	41.4N	071.1W	0734	0.3	4.9	1.2	3.9	28/15	17.9	W	40.8	10/21	1015.2
46001	56.3N	148.2W	0738	2.5	4.3	3.5	6.5	14/17	15.8	W	33.2	14/16	996.8
46002	42.5N	130.3W	0700	10.6	11.2	3.3	10.0	01/04	14.7	S	40.0	01/02	1013.5
46003	51.9N	155.9W	0738	3.3	4.3	3.7	7.1	14/18	14.0	S	28.4	10/01	996.4
46005	46.1N	131.0W	0597	9.0	9.5	3.4	7.2	01/04	15.8	S	33.0	01/03	1012.6
46006	40.9N	137.5W	0725	12.3	12.8	3.8	8.3	17/01					1010.4
46011	34.9N	120.9W	0739	12.8	13.3	2.3	4.3	03/02	10.7	NW	29.3	25/16	1018.1
46012	37.4N	122.7W	0740	11.6		2.5	4.7	02/04	11.1	NW	32.6	01/05	1017.0
46013	38.2N	123.3W	0620	10.9	12.2	2.6	5.3	01/09	12.8	E	30.1	15/01	1018.0
46014	39.2N	124.0W	0738	11.3	12.0	2.6	6.4	01/20	11.2	SE	37.5	01/01	1017.2
46022	40.8N	124.5W	0571	10.9	11.7	2.5	5.2	18/04	13.2	S	32.3	25/09	1016.6
46025	33.8N	119.1W	0728	13.8	14.2	1.5	3.1	03/01	8.0	NW	25.6	06/14	1018.0
46026	37.8N	122.8W	0738	10.8	11.8	2.3	5.4	01/08	12.2	E	33.6	01/04	1017.5
46027	41.9N	124.4W	0738	10.0	11.0	2.5	7.1	01/18	11.5	SE	37.3	01/03	1016.7
46028	35.7N	121.9W	0733	12.5	13.2	2.6	4.8	06/07	11.3	NW	29.1	20/06	1019.2
46029	46.2N	124.2W	0653	7.6	9.0	2.4	5.0	18/18	13.6	E	32.8	18/17	1017.5
46030	40.4N	124.5W	0739	10.8	11.8	2.6	5.7	01/00	14.7	N	39.1	01/00	1017.6
46035	56.9N	177.8W	0710	-0.3	3.0	3.7	11.0	08/22	22.5	E	49.9	08/14	1000.8
46041	47.4N	124.5W	0738		8.7	2.5	8.6	01/15	12.0	SE	36.1	01/09	1014.8
46042	36.8N	122.4W	0738		12.7	2.5	4.9	02/02	9.3	N	28.2	25/12	1018.2
46045	33.8N	118.5W	0741	13.6	14.1	1.2	2.5	02/20					1017.9
46050	44.6N	124.5W	0333	8.5	10.1	2.5	5.3	18/01	13.1	S	28.2	18/14	1013.5
46053	34.2N	119.9W	0225	13.7	14.1	1.6	3.4	02/18	9.2	W	27.0	05/22	1018.9
46054	34.3N	120.5W	0711	13.0	13.5	2.3	4.4	26/22	11.8	NW	32.4	06/00	1018.3
46059	38.0N	130.0W	0735	14.1	15.2	3.1	6.8	25/23	15.4	S	34.0	25/22	1016.8
46060	60.6N	146.8W	1469	1.4	4.8	1.0	3.0	13/07	13.1	E	37.7	13/07	1002.3
46061	60.2N	146.8W	1454	2.8	4.5	2.4	7.5	28/08	16.7	E	37.5	13/04	1001.9
51001	23.4N	162.3W	0739	21.6	23.5	3.5	6.0	09/20	13.9	SW	33.7	03/07	1014.6
51002	17.2N	157.8W	0739	25.0	25.8	2.3	4.3	18/20	10.8	E	27.5	17/14	1013.4
51003	19.1N	160.8W	0611	23.9	25.3	2.6	3.9	10/12	10.9	NE	25.6	17/05	1013.0
51004	17.4N	152.5W	0737	24.8		2.3	5.1	24/07	10.6	E	26.4	17/22	1014.3
91204	9.9N	139.7E	0552	28.8					9.6	NE	23.3	18/20	1009.5
91222	18.1N	145.8E	0131	24.5									1012.1
91251	11.4N	162.4E	0732	27.7					13.3	E	25.3	06/11	1009.4
91328	8.6N	149.7E	0738	27.9					6.1	NE	21.8	06/00	1010.2
91343	7.6N	155.2E	0738	28.2									1008.3
91352	6.2N	160.7E	0742	28.0					7.3	NE	23.5	31/21	1009.4
91355	5.4N	163.0E	0740	27.6					6.3	E	21.0	29/02	1007.9
91374	8.7N	171.2E	0741	27.4					6.0	NE	13.1	31/18	1009.9
91377	6.1N	172.1E	0510	27.9					6.3	E	23.3	31/07	1011.4
91411	8.3N	137.5E	0737	26.8									1009.2
91442	4.6N	168.7E	0740	28.3					9.8	NE	30.4	30/10	1008.8

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BUOY	LAT	LONG	OBS	MEAN AIR TP (C)	MEAN SEA TP (C)	MEAN SIG WAVE HT (M)	MAX SIG WAVE HT (M)	MAX SIG WAVE HT (DA/HR)	SCALAR MEAN WIND SPEED (KNOTS)	PREV WIND (DIR)	MAX WIND (KTS)	MAX WIND (DA/HR)	MEAN PRESS (MB)
ABAN6	44.3N	075.9W	0739	-7.3	0.9				5.6	SW	24.1	23/00	1015.1
ALSN6	40.5N	073.8W	0735	0.5		1.1	3.2	25/05	20.2	W	49.4	10/03	1017.1
BLIA2	60.8N	146.9W	1462	-0.4					18.5	N	42.7	27/18	1003.1
BURL1	28.9N	089.4W	0737	13.4					14.2	NE	33.2	09/20	1020.1
CARO3	43.3N	124.4W	0731	8.9					11.2	S	39.8	01/04	1016.5
CDRF1	29.1N	083.0W	0740	13.7					7.3	NE	21.8	09/13	1020.9
CHLV2	36.9N	075.7W	0739	5.4	7.5	0.9	2.6	01/06	17.0	SW	38.8	11/10	1019.6
CLKN7	34.6N	076.5W	0734	8.6					13.5	N	35.9	11/11	1020.8
CSBF1	29.7N	085.4W	0738	13.4					6.6	N	31.7	10/02	1021.1
DBLN6	42.5N	079.4W	0733	-3.3					17.4	SW	46.6	25/19	1014.9
DESW1	47.7N	124.5W	0728	17.9					13.4	SE	52.0	01/10	1010.3
DISW3	47.1N	090.7W	0212	-5.0					14.6	SE	40.1	05/02	1009.3
DPIA1	30.3N	088.1W	0740	11.3					12.2	N	32.4	28/12	1021.0
DRYF1	24.6N	082.9W	0727	20.6					11.8	NE	31.0	14/09	1019.1
DSLN7	35.2N	075.3W	0737	9.3		1.5	3.9	11/10	21.0	W	55.4	16/14	1019.1
DUCN7	36.2N	075.8W	0724	6.5		0.7	2.1	01/06	13.5	SW	33.4	16/12	1020.3
FBIS1	32.7N	079.9W	0738	9.7					8.9	SW	25.9	09/02	1020.3
FFIA2	57.3N	133.6W	0739	-0.4					16.4	N	36.6	01/11	1008.9
FPSN7	33.5N	077.6W	0737	12.1		1.5	4.0	16/11	19.4	W	46.1	11/07	1018.9
FWYF1	25.6N	080.1W	0737		24.1				13.8	E	33.7	25/15	1020.0
GDIL1	29.3N	090.0W	0733	12.9	14.7				11.8	NE	27.8	13/06	1020.7
IOSN3	43.0N	070.6W	0731	-2.4					18.4	W	39.2	17/09	1013.4
KTNF1	29.8N	083.6W	0734	12.5					7.9	NE	27.0	10/03	1020.6
LKWF1	26.6N	080.0W	0735	20.1	23.7				10.7	NW	30.1	13/23	1019.6
LONF1	24.9N	080.9W	0306	22.6					8.4	N	27.7	10/07	1018.3
MDRM1	44.0N	068.1W	0735	-2.5					22.5	NW	47.1	28/15	1012.1
MISM1	43.8N	068.9W	0735	-2.5					21.3	W	48.4	28/14	1012.9
MLRF1	25.0N	080.4W	0731	21.5	24.4				13.5	SE	33.1	10/07	1019.5
NWPO3	44.6N	124.1W	0548	7.3					10.4	E	29.5	21/05	1016.3
PILM4	48.2N	088.4W	0735	-10.3					17.4	NW	37.4	18/04	1012.3
POTA2	61.1N	146.7W	1454	-3.2					24.5	NE	47.6	09/03	1003.5
PTAT2	27.8N	097.1W	0736	11.4	13.6				11.8	N	30.6	12/16	1020.4
ROAM4	47.9N	089.3W	0476	-12.6					20.1	NW	43.0	22/16	1017.9
SANF1	24.5N	081.9W	0732	21.5	23.7				13.9	NE	34.3	14/10	1018.8
SAUF1	29.9N	081.3W	0730	13.8	15.3				9.4	N	28.0	30/07	1021.0
SBIO1	41.6N	082.8W	0734	-4.5					18.1	SW	40.6	05/23	1017.0
SGNW3	43.8N	087.7W	0737	-7.3					13.1	W	26.0	24/06	1015.8
SISW1	48.3N	122.9W	0741	5.8					12.1	SE	44.8	01/10	1015.8
SMKF1	24.6N	081.1W	0735	21.7	24.1				14.6	E	34.8	13/23	1019.6
SPGF1	26.7N	079.0W	0741	21.0					8.0	E	29.5	10/07	1020.0
SRST2	29.7N	094.1W	0727	10.1					9.4	N	26.1	28/13	1020.6
STDM4	47.2N	087.2W	0708	-7.3					21.4	NW	44.3	16/05	1013.3
SUPN6	44.5N	075.8W	0726	-7.8	0.8				12.0	SW	34.9	25/21	1015.8
THIN6	44.3N	076.0W	0735	-7.4									
TPLM2	38.9N	076.4W	0732	1.5	4.8				11.7	NW	29.6	10/19	1019.6
TTIW1	48.4N	124.7W	0739	6.4					17.8	E	58.7	01/12	1014.6
VENF1	27.1N	082.5W	0739	16.5	18.0				8.0	NE	28.0	17/00	1020.9
WPOW1	47.7N	122.4W	0727	6.4					10.9	S	36.6	01/10	1016.9

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41001	34.7N	072.6W	0737	17.3	21.6	2.5	6.5	10/00	15.9	S	40.4	09/19	1018.6
41002	32.3N	075.2W	0736	18.5	21.7	2.3	6.0	15/10	14.6	S	35.9	09/10	1019.1
41009	28.5N	080.2W	1484	20.7	23.7	1.4	2.9	09/10	13.2	N	32.1	09/07	1019.9
41010	28.9N	078.5W	1204	21.6	24.4	1.8	4.4	16/21	12.8	S	30.1	06/05	1019.1
41022	31.9N	080.9W	0241	13.5	14.3	0.6	1.6	01/15					1017.1
42001	25.9N	089.7W	0723	21.6	23.8	1.3	4.3	19/03	13.1	SE	32.4	19/16	1019.9
42002	25.9N	093.6W	0644	20.9	23.0	1.4	5.3	18/19	14.1	SE	31.5	18/17	1018.5
42003	25.9N	085.9W	0741	22.1	25.0				14.4	E	31.7	19/13	1019.0
42007	30.1N	088.8W	0743	14.4	16.3	0.6	2.0	01/05	11.5	S	32.8	17/00	1020.5
42019	27.9N	095.0W	0738	19.0		1.4	3.5	18/12	13.6	SE	27.0	18/08	1018.6
42020	27.0N	096.5W	0735	19.7		1.5	3.9	18/10	13.5	SE	30.3	18/00	1018.4
42035	29.3N	094.4W	0738	15.1	16.7	0.9	2.0	18/10					1018.8
42036	28.5N	084.5W	0741	18.5	21.8	1.0	3.3	19/16	12.2	N	26.2	19/13	1019.8
42039	28.8N	086.0W	0740	19.0	22.8	1.1	3.2	01/15	12.4	E	27.4	19/20	1020.8
42040	29.2N	088.3W	0739	18.1	21.4	1.1	2.9	01/03	12.5	S	29.3	17/00	1020.8
44004	38.5N	070.7W	0722	11.7	14.4				14.1	S	36.9	06/18	1018.6
44005	42.9N	069.0W	0297	4.0	6.2				16.8	SW	36.9	20/09	1019.6
44007	43.5N	070.2W	0737	3.0	6.2	1.4	5.1	08/11	13.3	W	29.5	20/10	1017.4
44008	40.5N	069.4W	0712	7.4	8.4	2.2	5.8	07/03	14.3	NE	33.8	20/06	1018.5
44009	38.5N	074.7W	0736	8.2	8.6	1.4	4.0	15/20	13.3	S	33.4	06/11	1018.1
44011	41.1N	066.6W	0724	7.0	7.3	2.5	6.6	07/08	14.6	S	34.4	20/12	1017.9
44013	42.4N	070.7W	0731	5.0	7.2	1.2	4.7	06/20	13.7	W	33.2	06/18	1018.2
44014	36.6N	074.8W	0740	9.5	10.2	1.8	4.6	14/23	13.1	S	34.8	14/20	1019.0
44025	40.3N	073.2W	0727	6.8	8.8	1.6	4.3	06/12	14.6	S	35.4	06/10	1018.1
44028	41.4N	071.1W	0739		7.1	1.1	3.7	02/13	14.6	NE	36.5	20/10	1018.4
45007	42.7N	087.0W	0277	1.4	5.2	1.2	3.2	09/00	16.3	W	26.8	08/19	1009.0
46001	56.3N	148.2W	0738	2.3	5.0	3.6	8.3	01/00	17.1	NW	33.6	01/00	1000.1
46002	42.5N	130.3W	0724	11.4	12.9	3.7	8.1	05/23	15.5	W	41.2	09/22	1010.4
46003	51.9N	155.9W	0735	3.1	5.2	4.6	13.6	03/19	17.6	NW	37.7	03/17	1003.9
46005	46.1N	131.0W	0360	9.1	10.8				15.4	S	36.3	29/06	1004.3
46006	40.9N	137.5W	0736	12.7	13.8	3.9	8.0	05/19					1010.8
46011	34.9N	120.9W	0738	13.2	13.3	2.1	4.6	07/06	9.6	NW	25.6	22/01	1017.8

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BUOY	LAT	LONG	OBS	MEAN AIR TP (C)	MEAN SEA TP (C)	MEAN SIG WAVE HT (M)	MAX SIG WAVE HT (M)	MAX SIG WAVE HT (DA/HR)	SCALAR MEAN WIND SPEED (KNOTS)	PREV WIND (DIR)	MAX WIND (KTS)	MAX WIND (DA/HR)	MEAN PRESS (MB)
46012	37.4N	122.7W	0741	12.3		2.4	5.0	29/22	12.6	SE	33.8	29/15	1016.5
46013	38.2N	123.3W	0538	11.9	12.1	2.7	5.6	29/20	10.7	NW	27.0	01/19	1017.7
46014	39.2N	124.0W	0741	12.1	12.7	3.0	6.6	06/11	13.3	SE	38.5	29/14	1015.6
46025	33.8N	119.1W	0737	14.5	14.7	1.1	2.7	22/18	6.9	W	25.3	22/15	1017.5
46026	37.8N	122.8W	0739	11.8	11.7	2.2	5.4	29/21	11.9	S	35.9	29/17	1016.9
46027	41.9N	124.4W	0735	10.9	11.1	3.0	6.5	02/06	13.9	SE	41.4	29/17	1012.9
46028	35.7N	121.9W	0738	12.9	13.1	2.5	5.2	02/13	10.5	NW	28.0	14/00	1019.0
46030	40.4N	124.5W	0738	11.7	12.1	3.0	6.2	29/18	16.1	SE	40.8	29/14	1015.0
46035	56.9N	177.8W	0673	2.0	3.7	4.0	9.8	08/11	22.0	E	47.8	02/01	1010.1
46041	47.4N	124.5W	0736		9.3	2.9	9.4	01/13	14.7	SE	34.2	31/23	1008.2
46042	36.8N	122.4W	0741	16.1	12.1	2.5	4.9	02/14	7.9	SE	24.7	29/18	1017.9
46045	33.8N	118.5W	0738	14.1	14.6	0.9	2.9	22/18					1017.5
46053	34.2N	119.9W	0737	14.1	14.3	1.2	2.6	11/21	8.2	W	27.4	09/23	1017.6
46054	34.3N	120.5W	0735	13.8	13.8	2.1	4.0	07/01	12.9	NW	37.1	18/09	1018.0
46059	38.0N	130.0W	0733	14.6	15.4	3.4	6.3	05/22					1015.5
46060	60.6N	146.8W	1477	2.3	5.9	0.8	2.8	18/04	12.2	N	35.2	18/02	1003.8
46061	60.2N	146.8W	1487		5.9	1.9	6.6	04/00	16.0	E	44.9	04/02	1003.3
51001	23.4N	162.3W	0739	23.1	25.3	3.5	7.1	15/08	16.5	NE	32.7	07/06	1014.6
51002	17.2N	157.8W	0742	25.0	25.7	2.8	5.3	08/16	15.5	E	27.8	04/06	1011.6
51003	19.1N	160.8W	0247	24.8	26.0	2.8	6.0	07/23	16.0	N	26.1	07/20	1012.2
51004	17.4N	152.5W	0735	24.8		2.7	4.9	08/15	15.4	NE	26.7	05/15	1013.0
91204	9.9N	139.7E	0505	29.2					13.8	NE	31.1	22/02	1005.2
91222	18.1N	145.8E	0133	26.2									1009.1
91251	11.4N	162.4E	0732	28.1					14.8	E	27.0	20/15	1006.8
91328	8.6N	149.7E	0734	28.1					6.1	NE	17.2	01/11	1007.4
91343	7.6N	155.2E	0735	28.1									1005.8
91352	6.2N	160.7E	0741	27.9					5.8	E	20.4	12/17	1007.1
91355	5.4N	163.0E	0742	27.5					5.2	E	20.1	25/09	1005.6
91374	8.7N	171.2E	0743	27.4					6.1	NE	17.0	06/20	1007.6
91377	6.1N	172.1E	0463	28.2					6.3	E	11.6	30/19	1009.2
91411	8.3N	137.5E	0725	27.3									1005.6
91442	4.6N	168.7E	0735	28.4					9.0	E	25.4	16/21	1006.5
ABAN6	44.3N	075.9W	0738	0.7	4.5				5.0	S	20.1	01/21	1017.7
ALSN6	40.5N	073.8W	0736	5.6		1.2	3.8	06/12	17.1	W	47.6	06/11	1018.6
BLIA2	60.8N	146.9W	1478	0.8					17.8	N	40.4	21/22	1004.5
BURL1	28.9N	089.4W	0734	15.1					13.2	S	39.0	01/08	1020.1
CARO3	43.3N	124.4W	0735	9.3					14.6	S	41.2	31/21	1011.8
CDRF1	29.1N	083.0W	0741	14.5					7.2	NE	25.4	01/16	1021.0
CHLV2	36.9N	075.7W	0740	8.5	9.1	1.1	3.0	14/21	16.3	S	48.6	02/02	1019.6
CLKN7	34.6N	076.5W	0740	11.2					11.4	N	29.8	20/04	1020.9
CSBF1	29.7N	085.4W	0735	14.3					6.2	E	23.5	09/05	1021.3
DBLN6	42.5N	079.4W	0741	2.0					12.6	SW	43.3	24/22	1015.8
DESW1	47.7N	124.5W	0736	12.1					15.4	SE	41.4	04/17	1008.5
DISW3	47.1N	090.7W	0740	-5.7					14.8	SW	33.3	31/00	1015.0
DPIA1	30.3N	088.1W	0739	13.8	15.5				10.9	SE	30.1	27/15	1020.8
DRYF1	24.6N	082.9W	0739	21.5					12.2	NE	30.0	19/18	1019.1
DSLN7	35.2N	075.3W	0737	11.7		1.6	4.8	02/08	19.2	N	48.8	02/06	1019.2
DUCN7	36.2N	075.8W	0727	9.5		0.9	2.9	16/04	12.6	S	35.5	15/01	1020.5
FBIS1	32.7N	079.9W	0738	11.4					7.4	SW	19.8	01/23	1020.9
FFIA2	57.3N	133.6W	0738	0.7					17.1	N	43.7	04/03	1006.2
FPSN7	33.5N	077.6W	0737	14.1		1.5	4.8	02/05	16.9	N	38.1	01/19	1019.3
FWYF1	25.6N	080.1W	0738		24.5				13.8	E	30.1	22/09	1019.9
GDIL1	29.3N	090.0W	0740	15.4	16.2				10.3	S	31.6	17/00	1020.4
IOSN3	43.0N	070.6W	0741	3.3					15.6	W	36.8	06/17	1018.0
KTNF1	29.8N	083.6W	0738	13.2					6.9	NE	24.5	01/12	1020.8
LKWF1	26.6N	080.0W	0736	21.2	24.1				10.8	NW	27.6	22/04	1019.5
LONF1	24.9N	080.9W	0664	21.4	23.8				10.0	N	27.0	20/01	1019.7
MDRM1	44.0N	068.1W	0736	3.4					18.4	S	48.1	08/12	1018.1
MISM1	43.8N	068.9W	0734	3.2					17.9	S	49.5	08/09	1018.3
MLRF1	25.0N	080.4W	0736	22.5	24.8				13.3	E	31.0	20/02	1019.4
NWPO3	44.6N	124.1W	0324	8.8					13.4	SW	39.5	02/18	1009.6
PILM4	48.2N	088.4W	0741	-6.2					14.8	N	31.5	16/00	1015.6
POTA2	61.1N	146.7W	1478	-1.3					24.1	N	41.4	20/19	1004.8
PTAT2	27.8N	097.1W	0736	16.5	17.8				11.0	SE	30.1	16/01	1019.1
SANF1	24.5N	081.9W	0734	22.4	24.4				14.0	NE	33.1	20/01	1018.2
SAUF1	29.9N	081.3W	0735	14.7	16.4				9.2	N	24.0	25/12	1021.3
SBIO1	41.6N	082.8W	0739	0.5					14.6	SW	36.0	01/16	1016.5
SGNW3	43.8N	087.7W	0738	-3.4					11.0	W	27.5	10/04	1015.5
SISW1	48.3N	122.9W	0738	4.5					14.5	SE	43.8	02/14	1010.0
SMKF1	24.6N	081.1W	0739	22.5	24.5				14.0	E	32.6	20/01	1019.5
SPGF1	26.7N	079.0W	0740	21.4					8.3	E	25.3	19/20	1020.0
SRST2	29.7N	094.1W	0738	13.7					9.6	S	20.6	26/18	1019.7
STDM4	47.2N	087.2W	0737	-3.7					17.0	W	46.3	24/11	1013.4
SUPN6	44.5N	075.8W	0734	0.4	4.3				9.3	S	32.8	25/01	1018.1
THIN6	44.3N	076.0W	0735	0.6									
TPLM2	38.9N	076.4W	0736	5.5	5.9				11.8	S	31.9	01/22	1019.6
TTIW1	48.4N	124.7W	0736	5.2					20.2	E	60.1	29/13	1007.9
VENF1	27.1N	082.5W	0739	17.2	18.2				8.2	NE	27.5	19/20	1020.9
WPOW1	47.7N	122.4W	0735	5.6					12.9	S	34.1	13/17	1010.8

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BUOY	LAT	LONG	OBS	MEAN AIR TP (C)	MEAN SEA TP (C)	MEAN SIG WAVE HT (M)	MAX SIG WAVE HT (M)	MAX SIG WAVE HT (DA/HR)	SCALAR MEAN WIND SPEED (KNOTS)	PREV WIND (DIR)	MAX WIND (KTS)	MAX WIND (DA/HR)	MEAN PRESS (MB)
NOVEMBER 1996													
41001	34.7N	072.6W	0715	16.9	22.4	2.3	5.6	18/12	14.7	NW	36.1	22/11	1020.8
41002	32.3N	075.2W	0711	19.5	24.0	2.2	5.2	22/19	13.8	N	28.0	09/03	1020.5
41009	28.5N	080.2W	1434	22.3	25.1	1.7	5.0	16/00	15.9	E	32.6	15/14	1019.9
41010	28.9N	078.5W	1433	22.3	25.3	2.2	5.6	18/11	15.0	NE	29.3	15/12	1019.3
41021	31.9N	080.9W	0349		19.5	0.7	1.9	15/11	13.1	NE	26.8	15/11	1023.4
41022	31.9N	080.9W	0718	15.1	17.3	0.7	2.1	16/16					1022.1
42001	25.9N	089.7W	0716	23.5	25.2	1.8	5.2	16/12	14.5	NE	29.7	08/11	1019.5
42002	25.9N	093.6W	0719	23.3	25.1	1.7	4.5	17/02	14.0	E	29.3	24/21	1018.1
42003	25.9N	085.9W	0718	23.8	26.0				17.0	E	33.2	16/03	1018.4
42007	30.1N	088.8W	0717	17.8	20.1	0.9	2.6	16/13	14.3	E	29.9	16/04	1020.7
42019	27.9N	095.0W	0714	21.7		1.7	4.0	17/00	14.6	SE	29.7	24/19	1018.4
42020	27.0N	096.5W	0711	22.8		1.7	3.7	24/12	15.1	SE	30.1	25/05	1017.9
42035	29.3N	094.4W	0715	18.9	20.8	1.1	3.4	16/18					1018.8
42036	28.5N	084.5W	0711	20.5	23.5	1.3	3.8	16/02	14.9	NE	29.1	16/00	1019.7
42039	28.8N	086.0W	0715	21.0	24.6	1.5	4.2	16/00	15.4	E	29.0	15/22	1020.8
42040	29.2N	088.3W	0710	20.6	23.9	1.4	4.0	16/08	14.6	NE	29.3	08/16	1020.7
44004	38.5N	070.7W	0702	11.3	16.8	2.2	7.4	17/13	14.6	NW	30.7	15/06	1021.1
44007	43.5N	070.2W	0712	4.1	8.5	0.9	3.7	09/16					1019.2
44008	40.5N	069.4W	0685	7.3	9.9	1.9	4.8	17/08	13.9	NW	28.2	27/21	1020.1
44009	38.5N	074.7W	0718	8.3	12.9	1.2	2.9	09/00	13.5	NW	35.6	26/23	1022.0
44011	41.1N	066.6W	0705	7.2	9.0	2.2	8.2	17/03	13.8	N	32.4	16/21	1018.0
44013	42.4N	070.7W	0695	5.6	9.8	1.0	2.9	17/12	13.2	NW	27.6	27/05	1020.0
44014	36.6N	074.8W	0717	10.3	13.0	1.7	4.6	18/03	12.8	N	31.1	27/02	1022.6
44025	40.3N	073.2W	0708	7.5	11.9	1.2	3.8	09/08	14.4	NW	28.8	27/01	1021.3
44028	41.4N	071.1W	0714		10.6	0.8	3.0	09/12	14.4	N	30.1	09/13	1020.5
45001	48.1N	087.8W	0060	-1.1	5.1	1.8	4.3	01/02	19.2	NW	30.7	01/08	1010.0
45002	45.3N	086.4W	0279	3.6	8.1	1.1	2.9	04/03	16.9	NW	27.6	04/01	1013.7
45003	45.3N	082.8W	0064	1.7	7.0	2.0	3.2	01/00	22.5	NW	28.4	01/20	1008.6
45004	47.6N	086.5W	0078	0.5	4.7	2.0	5.0	01/01	18.9	NW	32.3	01/00	1010.2
45005	41.7N	082.4W	0427	4.7	8.0				13.8	W	27.8	07/22	1021.5
45006	47.3N	089.9W	0205	3.0	5.0	1.2	3.3	07/10	16.0	W	29.0	01/00	1010.8
45007	42.7N	087.0W	0713	2.4	6.6	1.1	2.7	15/14	14.7	NW	27.0	15/13	1020.4
45008	44.3N	082.4W	0133	4.4	6.8	1.3	2.9	01/00	15.8	W	27.8	01/00	1016.4
46001	56.3N	148.2W	0712	4.8	6.5	3.1	8.7	30/20	15.8	E	34.6	30/19	1008.0
46002	42.5N	130.3W	0714	13.4	14.8	2.8	5.4	19/16	14.1	NW	30.1	19/11	1016.9
46003	51.9N	155.9W	0710	5.8	7.0	3.7	7.2	29/09	14.1	NW	27.4	29/02	1007.8
46005	46.1N	131.0W	0414	11.4	12.7	3.0	5.0	10/14	16.0	SW	31.1	23/10	1013.6
46006	40.9N	137.5W	0712	15.6	16.4	3.2	7.2	09/10					1016.8
46011	34.9N	120.9W	0716	13.6	13.7	2.0	4.2	20/07	11.2	NW	28.6	28/23	1017.1
46012	37.4N	122.7W	0718	12.0		2.0	4.3	19/23	11.5	NW	30.7	17/02	1017.4
46013	38.2N	123.3W	0566	12.0	11.8	2.3	5.7	19/20	12.3	NW	29.0	19/16	1018.8
46014	39.2N	124.0W	0718	12.3	12.4	2.2	5.6	19/19	11.9	NW	36.3	19/14	1018.2
46025	33.8N	119.1W	0710	15.6	16.0	1.2	2.8	16/02	7.3	NW	29.1	29/03	1015.8
46026	37.8N	122.8W	0716	11.9	11.8	1.9	5.1	19/23	11.4	NW	29.5	19/18	1017.9
46027	41.9N	124.4W	0713	10.8	11.1	2.2	6.8	19/16	8.9	SE	37.1	18/20	1017.8
46028	35.7N	121.9W	0717	13.1	13.4	2.3	4.8	29/09	12.9	NW	29.7	29/05	1018.8
46030	40.4N	124.5W	0716	11.1	11.1	2.1	5.9	19/16	11.8	N	37.1	19/13	1019.2
46035	56.9N	177.8W	0706	3.5	5.4	3.9	15.4	03/19	21.8	NE	54.8	03/19	1004.8
46041	47.4N	124.5W	0712		10.3	2.1	3.8	28/19	10.8	SE	30.1	30/19	1015.0
46042	36.8N	122.4W	0719	17.1	12.3	2.2	5.3	20/01	9.8	NW	24.9	17/01	1018.5
46045	33.8N	118.5W	0716	15.7	16.1	0.9	2.6	16/03	5.7	NW	23.9	30/03	1015.7
46053	34.2N	119.9W	0714	14.9	15.1	1.3	2.9	20/10	8.5	W	32.3	15/23	1016.2
46054	34.3N	120.5W	0707	14.2	14.0	2.0	4.3	23/08	15.0	NW	35.4	29/03	1017.0
46059	38.0N	130.0W	0708	16.3	16.9	2.5	6.5	19/07					1020.4
46060	60.6N	146.8W	1435	3.3	7.1	0.7	2.8	30/17	9.6	NW	39.6	30/17	1010.5
46061	60.2N	146.8W	1426		7.1	1.6	4.7	30/14	12.2	N	40.2	30/17	1010.4
51001	23.4N	162.3W	0716	24.5	25.7	3.5	7.8	14/09	12.5	NE	26.8	08/19	1015.2
51002	17.2N	157.8W	0719	26.3	27.0	2.7	5.3	15/11	15.8	E	27.4	30/01	1011.0
51003	19.1N	160.8W	0239	26.3	27.4	2.8	5.3	14/23	13.2	NE	23.3	18/05	1012.0
51004	17.4N	152.5W	0714	25.7		2.9	5.6	11/01	15.8	E	26.7	28/18	1013.3
51026	21.4N	156.9W	0482	24.8	25.8	3.0	6.8	10/21					1012.9
91204	9.9N	139.7E	0497	29.5					9.4	NE	35.0	08/20	1007.2
91222	18.1N	145.8E	0149	27.7									1011.1
91251	11.4N	162.4E	0703	28.4					12.5	NE	28.0	24/05	1007.7
91328	8.6N	149.7E	0717	28.0					7.0	NE	27.9	06/13	1007.8
91343	7.6N	155.2E	0717	28.1									1006.8
91352	6.2N	160.7E	0718	28.0					4.2	E	17.6	09/12	1008.3
91355	5.4N	163.0E	0718	27.1					5.3	E	20.5	27/00	1006.9
91374	8.7N	171.2E	0718	27.5					4.1	NE	13.7	19/02	1008.6
91377	6.1N	172.1E	0470	28.3					5.3	E	25.2	26/05	1010.6
91411	8.3N	137.5E	0683	28.2									1007.1
91442	4.6N	168.7E	0713	28.3					8.3	E	27.5	26/22	1007.9
ABAN6	44.3N	075.9W	0712	1.0	7.6				3.9	N	28.1	08/04	1021.4
ALSN6	40.5N	073.8W	0712	6.5		0.8	3.3	09/06	16.1	W	43.6	09/06	1021.8
BLIA2	60.8N	146.9W	1435	1.7					14.2	N	34.2	30/17	1011.3
BURL1	28.9N	089.4W	0712	19.3					14.1	NE	32.9	16/09	1020.0
CARO3	43.3N	124.4W	0714	10.4					10.0	S	46.2	19/11	1017.2
CDRF1	29.1N	083.0W	0717	17.3					9.2	NE	31.4	15/18	1021.2
CHLV2	36.9N	075.7W	0715	9.6	14.1	1.1	2.7	15/14	14.7	N	38.8	27/03	1023.3
CLKN7	34.6N	076.5W	0715	12.0					12.0	N	34.7	08/23	1023.4
CSBF1	29.7N	085.4W	0714	16.8					7.1	NE	25.9	26/10	1021.5

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BUOY	LAT	LONG	OBS	MEAN AIR TP (C)	MEAN SEA TP (C)	MEAN SIG WAVE HT (M)	MAX SIG WAVE HT (M)	MAX SIG WAVE HT (DA/HR)	SCALAR MEAN WIND SPEED (KNOTS)	PREV WIND (DIR)	MAX WIND (KTS)	MAX WIND (DA/HR)	MEAN PRESS (MB)
DBLN6	42.5N	079.4W	0713	3.5					13.2	W	38.6	01/18	1021.0
DESW1	47.7N	124.5W	0712	11.8					12.0	SE	37.5	30/20	1015.2
DISW3	47.1N	090.7W	0714	-1.7					13.8	W	42.6	17/23	1020.1
DPIA1	30.3N	088.1W	0715	16.8	18.4				13.4	NE	27.2	27/07	1021.2
DRYF1	24.6N	082.9W	0711	23.6					16.4	NE	32.4	16/04	1017.9
DSLN7	35.2N	075.3W	0715	12.8		1.7	4.7	22/14	18.9	N	45.4	26/10	1022.1
DUCN7	36.2N	075.8W	0701	10.1		0.9	3.2	18/07	12.3	NW	37.8	22/12	1023.9
FBIS1	32.7N	079.9W	0712	13.7					9.9	NE	27.5	22/09	1022.7
FFIA2	57.3N	133.6W	0717	2.6					16.4	N	38.2	15/05	1013.4
FPSN7	33.5N	077.6W	0712	14.5		1.5	3.8	08/22	16.5	N	39.5	08/20	1021.7
FWYF1	25.6N	080.1W	0713		26.1				18.7	E	42.2	16/00	1018.9
GDIL1	29.3N	090.0W	0712	18.9	20.3				11.7	NE	26.9	08/03	1020.4
IOSN3	43.0N	070.6W	0712	4.1					14.0	W	35.3	09/11	1019.8
KTNF1	29.8N	083.6W	0714	15.7					8.8	NE	24.4	08/15	1021.2
LKWF1	26.6N	080.0W	0552	23.2	25.4				16.4	NE	34.5	15/22	1019.5
LONF1	24.9N	080.9W	0712	23.2	23.5				14.5	E	29.4	17/03	1018.6
MDRM1	44.0N	068.1W	0712	4.0					16.9	N	36.2	27/10	1019.1
MISM1	43.8N	068.9W	0712	4.2					16.6	N	34.6	27/06	1019.4
MLRF1	25.0N	080.4W	0712	24.2	26.0				17.8	E	38.3	16/02	1018.2
NWPO3	44.6N	124.1W	0711	9.6					9.9	E	50.9	19/11	1016.7
PILM4	48.2N	088.4W	0716	-2.3					16.5	NW	43.4	18/07	1019.9
POTA2	61.1N	146.7W	1420	-1.3					24.1	N	46.2	10/21	1011.4
PTAT2	27.8N	097.1W	0712	20.2	21.9				13.8	SE	29.2	07/00	1018.7
ROAM4	47.9N	089.3W	0147	2.6					18.7	N	40.8	07/09	1010.9
SANF1	24.5N	081.9W	0401	25.0	26.3				15.4	E	27.0	28/19	1016.4
SAUF1	29.9N	081.3W	0713	18.6	20.0				12.2	N	36.6	15/17	1021.5
SBIO1	41.6N	082.8W	0713	3.0					13.7	W	30.7	07/20	1022.5
SGNW3	43.8N	087.7W	0716	-0.2					11.7	NW	33.5	15/15	1022.2
SISW1	48.3N	122.9W	0711	6.8					10.6	SE	44.8	30/21	1015.9
SMKF1	24.6N	081.1W	0713	24.1	26.2				18.4	NE	39.5	16/16	1018.1
SPGF1	26.7N	079.0W	0717	23.1					10.9	E	24.2	16/05	1019.4
SRST2	29.7N	094.1W	0717	17.4					11.3	SE	31.0	16/18	1019.8
STDM4	47.2N	087.2W	0714	-0.6					18.7	NW	47.2	16/01	1018.6
SUPN6	44.5N	075.8W	0524	1.4	7.5				9.8	SW	30.0	08/06	1020.1
SVLS1	32.0N	080.7W	0639	15.5	18.6	1.1	2.8	16/16	16.0	N	36.3	16/07	1021.6
THIN6	44.3N	076.0W	0714	0.9									
TPLM2	38.9N	076.4W	0715	6.7	10.1				10.6	NW	28.7	26/21	1023.6
TTIW1	48.4N	124.7W	0707	7.2					14.0	E	37.9	24/00	1015.0
VENF1	27.1N	082.5W	0243	19.4	20.6				9.0	NE	22.3	26/19	1019.4
WPOW1	47.7N	122.4W	0710	7.6					10.7	S	35.6	28/05	1016.7

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41001	34.7N	072.6W	0736	21.6	24.1	1.9	7.2	09/02	12.1	N	33.6	08/21	1017.3
41002	32.3N	075.2W	0734	23.2	24.9	2.0	6.5	08/22	12.3	NE	28.8	08/15	1016.7
41009	28.5N	080.2W	1476	25.2	27.2	1.6	5.0	05/16	7.4	NW	10.7	31/14	1015.8
41010	28.9N	078.5W	1473	24.9	26.5	1.9	5.3	04/23	12.6	NE	31.5	05/08	1015.3
41021	31.9N	080.9W	0734		22.0	0.7	2.4	08/08	12.0	NE	34.2	08/05	1018.2
41022	31.9N	080.9W	0738	20.6	22.2	0.7	2.6	08/08					1017.5
42001	25.9N	089.7W	0729	25.9	27.2	1.6	5.2	07/18	13.7	NE	32.4	07/14	1015.0
42002	25.9N	093.6W	0734	26.1	27.2	1.6	6.1	06/22	13.9	SE	40.8	06/23	1013.8
42003	25.9N	085.9W	0733	26.0	27.9				14.6	E	40.0	07/13	1014.1
42007	30.1N	088.8W	0737	21.7	23.5	0.6	1.7	26/05	13.5	NE	32.3	06/10	1016.9
42019	27.9N	095.0W	0733	24.9		1.6	5.5	06/11	14.8	NE	33.4	05/18	1014.7
42020	27.0N	096.5W	0734	25.6		1.8	6.8	06/09	14.0	SE	32.4	22/12	1014.2
42035	29.3N	094.4W	0734	23.0	24.3	1.1	3.4	06/01	14.6	NE	29.3	06/03	1015.5
42036	28.5N	084.5W	0736	24.2	26.0	1.2	6.7	07/21	13.0	NE	40.6	07/22	1015.3
42039	28.8N	086.0W	0737	25.3	26.3	1.4	6.6	07/19	14.0	NE	41.8	07/18	1016.4
42040	29.2N	088.3W	0730	23.6	25.8	1.5	6.2	06/23	13.8	E	38.5	07/14	1016.8
44004	38.5N	070.7W	0736	16.9	19.5	2.2	8.5	09/07	14.0	W	38.3	09/06	1017.7
44007	43.5N	070.2W	0735	10.1	11.1	1.2	7.0	21/08	12.3	S	31.7	21/10	1016.3
44008	40.5N	069.4W	0719	12.3	12.1	1.9	7.2	09/10	12.1	W	30.5	20/06	1017.4
44009	38.5N	074.7W	0733	15.4	17.3	1.3	4.7	08/20	12.8	SW	39.1	08/19	1017.3
44011	41.1N	066.6W	0734	11.8	11.2	2.3	7.6	09/15	13.9	NW	33.4	09/14	1015.9
44013	42.4N	070.7W	0721	11.8	12.6	1.1	5.8	20/18	11.8	NW	36.5	09/05	1016.9
44014	36.6N	074.8W	0733	16.6	16.9	1.5	5.3	08/22	11.2	NE	32.1	08/17	1018.0
44025	40.3N	073.2W	0728	14.0	15.2	1.4	5.3	19/19	12.8	SW	41.2	09/00	1017.3
44028	41.4N	071.1W	0716		14.8	0.9	3.6	20/07	13.8	SW	42.9	09/02	1017.3
45001	48.1N	087.8W	0736	6.4	7.3	1.2	4.5	31/00	14.9	SE	35.6	31/01	1012.5
45002	45.3N	086.4W	0733	9.1	10.2	1.1	3.1	30/05	14.8	S	31.7	30/14	1013.4
45003	45.3N	082.8W	0732	8.5	10.0	1.0	3.7	02/20	14.7	S	34.4	02/18	1014.9
45004	47.6N	086.5W	0735	6.1	6.2	1.2	6.5	30/19	13.8	S	36.9	30/17	1013.6
45005	41.7N	082.4W	0732	12.7	14.2				13.0	S	36.3	30/13	1016.0
45006	47.3N	089.9W	0734	7.3	7.3	1.0	4.0	30/16	13.6	W	35.8	30/15	1012.0
45007	42.7N	087.0W	0730	11.4	13.1	1.0	4.0	30/11	14.2	S	36.3	30/09	1014.7
45008	44.3N	082.4W	0733	9.3	9.4	0.9	3.3	30/04	12.7	S	30.7	31/16	1016.0
46001	56.3N	148.2W	0727	6.5	8.1	3.0	8.8	02/21	15.9	W	39.2	02/23	1002.8
46002	42.5N	130.3W	0736	15.5	16.8	3.0	6.7	25/17	14.4	N	30.7	17/17	1018.0
46003	51.9N	155.9W	0738	7.8	8.6	3.1	7.1	31/18	14.4	W	29.5	23/19	1006.0
46005	46.1N	131.0W	0631	14.0	15.2	3.1	7.9	18/07	14.9	SW	37.1	17/11	1015.6
46006	40.9N	137.5W	0731	17.0	18.1	2.8	6.6	13/07					1020.6
46011	34.9N	120.9W	0736	14.2	14.4	2.1	5.2	26/16	12.0	NW	29.9	20/00	1014.1
46012	37.4N	122.7W	0736	13.2	13.8	1.9	4.8	26/07	9.9	NW	30.7	26/01	1015.1

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BUOY	LAT	LONG	OBS	MEAN AIR TP (C)	MEAN SEA TP (C)	MEAN SIG WAVE HT (M)	MAX SIG WAVE HT (M)	MAX SIG WAVE HT (DA/HR)	SCALAR MEAN WIND SPEED (KNOTS)	PREV WIND (DIR)	MAX WIND (KTS)	MAX WIND (DA/HR)	MEAN PRESS (MB)
46013	38.2N	123.3W	0359	13.4	13.0	1.8	4.0	14/14	9.5	NW	26.4	16/02	1015.5
46014	39.2N	124.0W	0739	13.0	13.1	2.3	6.1	26/05	9.1	NW	26.2	25/20	1016.6
46025	33.8N	119.1W	0729	16.6	18.1	1.1	3.5	26/02	7.4	W	32.8	26/02	1013.0
46026	37.8N	122.8W	0733	12.9	12.9	1.8	4.5	26/03	10.2	NW	29.0	26/02	1015.6
46027	41.9N	124.4W	0735	11.8	11.7	2.2	5.9	25/22	7.6	SE	27.6	18/06	1016.7
46028	35.7N	121.9W	0736	13.9	14.2	2.3	5.7	26/19	14.2	NW	30.7	26/07	1015.9
46030	40.4N	124.5W	0732	11.9	11.3	2.3	6.1	26/02	8.9	N	24.7	18/09	1017.9
46035	56.9N	177.8W	0733	5.8	8.1	2.6	9.6	28/01	16.8	NE	46.0	27/21	1012.8
46041	47.4N	124.5W	0733		12.5	2.4	7.5	18/15	10.9	SE	37.3	17/20	1015.3
46042	36.8N	122.4W	0737	17.1	14.5	2.2	6.0	26/08	8.8	NW	26.8	26/03	1015.9
46045	33.8N	118.5W	0736	16.5	17.7	0.9	3.5	26/03	6.4	NW	32.8	26/00	1012.9
46051	34.5N	120.7W	0507		15.5	2.1	4.3	20/02	14.6	NW	29.3	20/00	1013.8
46053	34.2N	119.9W	0731	15.9	16.8	1.2	2.8	19/23	8.7	W	33.4	19/22	1013.2
46054	34.3N	120.5W	0734	14.9	15.6	2.1	4.2	20/02	17.4	NW	37.5	26/05	1013.9
46059	38.0N	130.0W	0734	17.7	18.7	2.6	5.5	26/06					1020.8
46060	60.6N	146.8W	1472	5.5	9.0	0.7	2.7	13/01	11.0	NW	39.6	13/01	1003.9
46061	60.2N	146.8W	1472		9.3	1.6	5.3	12/16	14.4	NW	38.5	12/23	1003.7
51001	23.4N	162.3W	0576	26.7	27.5	2.5	5.2	27/11	10.3	E	21.3	20/12	1015.4
51002	17.2N	157.8W	0738	26.7	27.5	2.2	3.5	28/18	15.7	E	24.2	23/16	1012.4
51003	19.1N	160.8W	0363	27.3	28.2	2.1	4.0	28/02	10.6	NE	21.0	17/02	1013.3
51004	17.4N	152.5W	0733	26.0		2.3	3.4	17/07	14.8	NW	23.8	22/23	1014.0
51026	21.4N	156.9W	0726	26.0	26.8	2.0	3.3	06/08					1015.6
91204	9.9N	139.7E	0503	29.5					6.2	E	23.3	31/05	1008.8
91222	18.1N	145.8E	0523	27.9									1010.5
91251	11.4N	162.4E	0723	28.7					10.3	E	28.9	01/04	1008.5
91328	8.6N	149.7E	0733	28.3					4.4	NE	22.5	30/19	1009.9
91343	7.6N	155.2E	0734	28.2									1008.0
91352	6.2N	160.7E	0735	28.1					4.3	NE	23.8	09/05	1009.2
91355	5.4N	163.0E	0734	27.5					5.4	E	20.5	01/02	1007.8
91374	8.7N	171.2E	0736	27.9					4.1	NE	13.5	05/22	1009.5
91377	6.1N	172.1E	0473	28.3					6.8	E	27.2	03/18	1011.2
91411	8.3N	137.5E	0692	28.1									1008.6
91442	4.6N	168.7E	0731	28.3					8.9	SE	29.1	21/05	1008.7
ABAN6	44.3N	075.9W	0739	9.6	13.2				5.1	S	22.3	20/13	1017.7
ALSN6	40.5N	073.8W	0732	14.0		1.1	4.9	19/19	15.2	W	54.0	19/18	1017.7
BLIA2	60.8N	146.9W	1471	4.4					17.5	N	35.9	03/22	1004.8
BURL1	28.9N	089.4W	0733	23.4					14.3	E	40.7	07/03	1017.6
BUSL1	27.9N	090.9W	0519	24.6					16.6	E	51.7	07/02	1013.0
CARO3	43.3N	124.4W	0735	11.4					9.3	S	31.7	19/00	1017.1
CDRF1	29.1N	083.0W	0733	22.1					9.1	NE	34.8	08/02	1016.7
CHLV2	36.9N	075.7W	0733	17.1	18.8	1.1	3.4	08/15	14.8	NE	43.0	08/14	1018.4
CLKN7	34.6N	076.5W	0736	19.4					12.2	NE	39.2	08/15	1018.2
CSBF1	29.7N	085.4W	0736	21.3					6.7	NE	20.2	07/20	1017.2
DBLN6	42.5N	079.4W	0737	12.1					11.5	SE	48.3	30/18	1016.6
DESW1	47.7N	124.5W	0732	16.2					12.1	SE	47.9	17/20	1015.6
DISW3	47.1N	090.7W	0735	8.7					14.2	S	41.4	30/12	1013.1
DPIA1	30.3N	088.1W	0533	20.9	22.4				13.1	NE	39.0	07/17	1017.0
DRYF1	24.6N	082.9W	0732	26.1					13.7	E	25.4	12/23	1014.2
DSLN7	35.2N	075.3W	0734	19.2		1.6	5.4	08/19	17.4	NE	61.3	08/16	1017.7
DUCN7	36.2N	075.8W	0727	17.6		1.0	3.0	08/16	12.4	NE	47.8	08/16	1019.3
FBIS1	32.7N	079.9W	0735	19.8					8.8	NE	29.9	08/06	1018.1
FFIA2	57.3N	133.6W	0733	6.2					13.5	SE	39.6	28/17	1008.3
FWYF1	25.6N	080.1W	0733		27.5				14.9	E	42.8	08/13	1015.3
GDIL1	29.3N	090.0W	0733	22.7	23.6				12.2	NE	34.4	06/05	1016.7
IOSN3	43.0N	070.6W	0735	10.4					14.1	NW	43.8	21/00	1016.8
KTNF1	29.8N	083.6W	0735	20.5					8.0	NE	24.8	08/03	1016.8
LKWF1	26.6N	080.0W	0730	25.7	27.2				12.5	E	30.3	12/18	1015.2
LONF1	24.9N	080.9W	0733	26.0	26.4				12.6	E	29.8	08/13	1014.9
MDRM1	44.0N	068.1W	0736	9.5					16.7	NW	45.2	09/10	1016.7
MISM1	43.8N	068.9W	0733	9.5					16.6	S	44.1	21/02	1016.9
MLRF1	25.0N	080.4W	0731	26.4	27.7				14.3	E	33.6	08/11	1014.7
NWPO3	44.6N	124.1W	0734	11.0					8.8	S	38.5	18/02	1016.6
PILM4	48.2N	088.4W	0736	6.1					16.3	E	51.7	30/18	1011.2
POTA2	61.1N	146.7W	1474	2.7					21.0	NE	37.1	26/17	1005.0
PTAT2	27.8N	097.1W	0730	24.0	25.0				12.8	SE	29.8	05/19	1015.0
ROAM4	47.9N	089.3W	0712	7.5					16.4	SW	40.0	30/16	1012.8
SANF1	24.5N	081.9W	0737	26.3	27.3				15.0	NE	31.7	08/13	1013.7
SAUF1	29.9N	081.3W	0729	22.8	24.3				10.9	NE	35.0	04/21	1017.1
SBIO1	41.6N	082.8W	0733	12.5					12.4	S	50.6	30/13	1017.2
SGNW3	43.8N	087.7W	0733	9.5					11.8	S	30.0	30/14	1015.9
SISW1	48.3N	122.9W	0666	10.1					11.0	SE	42.2	17/20	1017.1
SMKF1	24.6N	081.1W	0729	26.4	27.6				15.8	E	42.1	08/18	1014.6
SPGF1	26.7N	079.0W	0736	25.5					9.2	E	24.0	12/12	1015.7
SRST2	29.7N	094.1W	0732	21.5					10.9	SE	27.8	25/04	1016.4
STDM4	47.2N	087.2W	0731	6.9					19.1	S	56.2	30/16	1013.1
SUPN6	44.5N	075.8W	0714	9.6	13.4				10.6	S	33.5	31/17	1018.3
SVLS1	32.0N	080.7W	0730	19.1	22.6	0.8	3.2	08/09	14.1	N	39.5	08/01	1017.5
THIN6	44.3N	076.0W	0734	9.5									
TPLM2	38.9N	076.4W	0735	14.9	17.0				10.5	S	38.9	08/19	1018.5
TTIW1	48.4N	124.7W	0737	10.5					13.7	E	37.2	24/02	1015.5
VENF1	27.1N	082.5W	0172	25.2	28.1				10.3	E	34.0	08/05	1014.2
WPOW1	47.7N	122.4W	0736	10.9					10.4	S	35.1	14/22	1016.9

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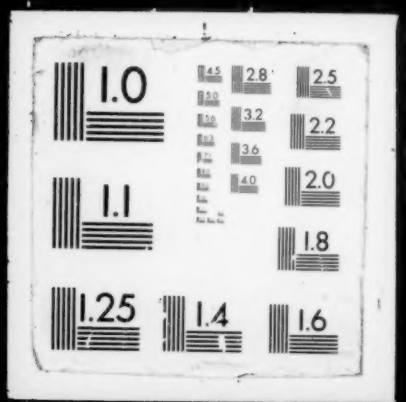
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